HAZELWOOD MINE FIRE INQUIRY REPORT 2014

Hazelwood
Mine Fire
Inquiry

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HAZELWOOD MINE FIRE INQUIRY REPORT

THE HON. BERNARD TEAGUE AO – CHAIRPERSON

PROF. JOHN CATFORD – BOARD MEMBER

MS SONIA PETERING – BOARD MEMBER

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Hazelwood
Mine Fire
Inquiry

LETTER OF TRANSMISSION

His Exellency the Honourable Alex Chernov AC QC
Governor of Victoria
Government House
Melbourne VIC 3004

29 August 2014

Your Excellency

In accordance with the Terms of Reference dated 21 March 2014, we have the honour of presenting to you the report of the Hazelwood Mine Fire Inquiry.

The report consists of one volume including an executive summary and 18 recommendations for improvement together with the Board's record of its affirmations of actions by the Victorian Government and GDF Suez already announced or underway. In addition, the Board has set out in the text its views about matters which need further consideration and action.

Undertaking this work has been a privilege and we would like to thank the people of Morwell and the Latrobe Valley for their hospitality and their generosity. We also appreciate the contribution of the community, industry and government agencies to the Inquiry's conclusions and recommendations.

We hope the work undertaken through and by this Inquiry will assist to prevent a disaster like that of February and March 2014 from ever happening again.

Yours sincerely,

The Hon. Bernard Teague AO Prof. John Catford Ms Sonia Petering

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APPOINTMENT OF A BOARD OF INQUIRY INTO
THE HAZELWOOD COAL MINE FIRE

Order in Council

As:

- the Hazelwood Coal Mine, associated with the Hazelwood Power Station, is situated south of Morwell in the Latrobe Valley and consists of various sections on or adjacent to land on which mining is taking place, has taken place or may take place under Mining Licence Number 5004 (MIN 5004) as in force from time to time;
- in early February a fire ignited which, on or about 9 February 2014, took hold in the Hazelwood Coal Mine ('Hazelwood Coal Mine Fire'); and
- the people of Morwell and other residents of the Latrobe Valley have been adversely affected by the Hazelwood Coal Mine Fire ('affected communities'),

the Governor in Council considers it expedient that a Board of Inquiry be appointed for the purposes of inquiring into, and reporting on, and making any recommendations that the Board considers appropriate in relation to, the matters specified below.

The Governor of the State of Victoria, in the Commonwealth of Australia, by and with the advice of the Executive Council and acting pursuant to section 88C of the **Constitution Act 1975** and all other enabling powers, appoints:

- The Honourable Bernard George Teague AO
- Professor John Charles Catford
- Ms Sonia Anne Petering

as a Board to inquire into, and report on, and make any recommendations that the Board considers appropriate in relation to the matters specified below.

The specified matters are as follows:

1. The origin and circumstances of the fire, including how it spread into the Hazelwood Coal Mine.
2. The adequacy and effectiveness of the measures taken by or on behalf of the owner, operator and licensee of the Hazelwood Coal Mine to prevent the outbreak of a fire, and to be prepared to respond to an outbreak of a fire including mitigating its spread and severity, in the Hazelwood Coal Mine, including whether the owner, operator and licensee of the Hazelwood Coal Mine, or any person or entity acting on behalf of any of them:
   i. implemented the recommendations arising from reviews of previous events; and
   ii. in the opinion of the Board, breached or did not comply with the requirements of (or under) any relevant statute or regulation, including any notification or directive given under such statute or regulation and any code of practice, management plan or similar scheme, developed and/or implemented due to such requirements.
3. The adequacy and effectiveness of the application and administration of relevant regulatory regimes in relation to the risk of, and response to, fire at the Hazelwood Coal Mine.
4. The adequacy and effectiveness of the response to the Hazelwood Coal Mine Fire by:
   i. the owner, operator and licensee of the Hazelwood Coal Mine;
   ii. the emergency services; and
   iii. other relevant government agencies, including environmental and public health officials,

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and, in particular, the measures taken in respect of the health and well-being of the affected communities by:

iv. informing the affected communities of the Hazelwood Coal Mine Fire and about its known effects and risks; and

v. responding to those effects on, and risks to, the affected communities.

5. Any other matter reasonably incidental to the matters specified in paragraphs 1 to 4.

The Board is directed to:

A. seek, in the conduct of its inquiry, not to prejudice any ongoing response or recovery activities or any investigations into the Hazelwood Coal Mine Fire by Victoria Police or a coroner;

B. work co-operatively, as appropriate, with other inquiries or investigations into the Hazelwood Coal Mine Fire to avoid unnecessary duplication;

C. conduct its inquiry otherwise as it considers appropriate, having regard to the desirability of adopting informal and flexible procedures that engage with the affected communities, ascertain the relevant facts as directly and effectively as possible and avoid unnecessary delay or cost; and

D. report to the Governor its findings, and any recommendations, by 31 August 2014 at the latest.

The Governor in Council confirms and declares that:

- the Honourable Bernard George Teague AO is appointed as Chairperson of the Board;
- subject to the provisions of the **Evidence (Miscellaneous Provisions) Act 1958**, the powers of the Board may at any time be exercised by one or more members of the Board; and
- the Board has full power and authority to inquire into the specified matters by all lawful ways and means whatsoever.

By His Excellency's Command

Dated 21 March 2014

Responsible Minister:
THE HON DR DENIS NAPTHINE MP
Premier

YVETTE CARISBROOKE
Clerk of the Executive Council

Images source *AAP Newswire*

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EXECUTIVE SUMMARY

THE HAZELWOOD MINE FIRE

Victoria is one of the most bushfire prone areas in the world. Victoria experiences bushfires every fire season. Many of these bushfires are catastrophic events resulting in the loss of life and property. The Latrobe Valley, like much of Victoria and many parts of Australia, has been greatly affected by bushfire. Five years ago, on Black Saturday, the Churchill fire claimed 11 lives, injured 35 others and destroyed 145 houses.

The Latrobe Valley is home to three open cut brown coal mines. Open cut brown coal mines are particularly vulnerable to fire and to fire that spreads quickly and is difficult to extinguish.

Victoria experienced one of its hottest and driest summers on record in 2014. In mid-January 2014, Melbourne endured its most prolonged heatwave since 1908, with four consecutive days over 40°C. Between 7 and 9 February 2014, emergency services and firefighting resources were committed to responding to multiple significant fires across the State and within the Latrobe Valley. The Fire Services Commissioner and the Chief Health Officer made several announcements warning the community about the potential for extreme weather conditions and associated fire and health risks. On 9 February 2014, the entire State of Victoria was facing the most extreme weather conditions since Black Saturday.

The Hazelwood mine fire that began on 9 February 2014 was the largest and longest burning mine fire that has occurred in the Latrobe Valley to date. The fire was caused by embers spotting into the Hazelwood mine from bushfires burning in close proximity to the mine. The mine fire burned for 45 days. The fire sent smoke and ash over the town of Morwell and surrounding areas for much of that time.

On 11 March 2014, a day after the fire was declared under control, Dr Denis Napthine MP, Premier of Victoria, announced an independent inquiry into the Hazelwood mine fire. On 21 March 2014, the Governor in Council officially established the Board of Inquiry, which comprised the Honourable Bernard Teague AO, Professor Emeritus John Catford, and Ms Sonia Petering.

The Hazelwood mine fire constituted two emergencies: a major complex fire emergency and a serious public health emergency.

The Inquiry's Terms of Reference required the Board to inquire into and report on a range of issues, including the origin of the fire, the firefighting response, fire prevention and preparedness measures taken by the owner, operator and licensee of the mine and regulatory agencies, the fire's impacts on the health and wellbeing of affected communities, and the response to the health emergency.

The mine owner, operator and licence holder of the Hazelwood mine is a partnership of subsidiary companies majority owned by GDF Suez S.A. In this Executive Summary, 'GDF Suez' is used to refer to the owner, operator and licence holder of the Hazelwood mine and all of its related entities. The term 'the State' is used broadly to refer to the Victorian Government, the Victorian public service and Victorian government authorities and agencies.

The impact of the Hazelwood mine fire on the Latrobe Valley community has been significant. People have been affected in many ways. First and foremost, the community has experienced adverse health effects and may be affected for an indeterminate period into the future.

Many people and local businesses have experienced financial impacts for a range of reasons including a downturn in business, medical costs, veterinary costs, time taken off work, relocation from their homes, cleaning their homes and businesses, and possible decreases in property value.

It is impossible to quantify the cost of the Hazelwood mine fire, but the Board estimates the total cost borne by the Victorian Government, the local community and the operator of the Hazelwood mine, GDF Suez, exceeds $100 million.

The Board commends all firefighters, including both emergency services personnel and GDF Suez employees, who worked under difficult conditions to protect Hazelwood mine assets and prevent fire spreading into the operating area of the mine. The Board recognises in particular the tireless dedication

of the volunteers who responded to the Hazelwood mine fire, including volunteer firefighters and other emergency services personnel, local hospital and other healthcare staff, not-for-profit and community based organisations, and the many individuals and organisations in the local community who went above and beyond what was expected of them throughout the course of this event.

Extreme bushfire conditions like those experienced in the summer of 2014 are occurring with increasing frequency and severity. They will happen again. The Latrobe Valley is particularly vulnerable.

Despite the high risk of a catastrophic fire event occurring and the all too recent experience of Black Saturday etched in our memory, many Victorians continue to underestimate the probability of fire events and 'hope for the best' in the fire season. This approach ultimately impedes the ability to prepare for, and to respond to, the reality of fire. It is imperative that government agencies and operators of essential infrastructure, in particular the brown coal mining industry, learn from this event and are better prepared to manage fire risk and respond to fire in the future.

This Inquiry took place against a backdrop of significant ongoing reform following lessons learned from the 2009 Victorian Bushfires Royal Commission, particularly in the areas of emergency management and integrated fire management planning.

During the Inquiry, the State and GDF Suez expressed a commitment to undertake numerous additional actions in response to the Hazelwood mine fire. The Board has affirmed a number of these commitments. However, there is more work to be done. The Board of Inquiry makes 18 recommendations to the State and GDF Suez, which have been drafted taking into account the feasibility of implementation, as well as the issues raised by the Latrobe Valley community.

Chapter 1 of this report contains important background information, including key facts regarding the Latrobe Valley, the town of Morwell and the Hazelwood mine, as well as an explanation of the Board's role and the assumptions underlying the Board's discussions, conclusions and recommendations. It also contains a guide to reading the report and should be the starting point for all readers.

ORIGIN OF THE HAZELWOOD MINE FIRE

The Hazelwood mine fire was not just one fire—it was a complex of fires. The fire started as a series of smaller fires that ignited in the northern, eastern and south-eastern batters and floor of the Hazelwood mine on 9 February 2014.

While various suggestions were made during the course of the Inquiry that fire may have started from within the Hazelwood mine, possibly from an existing fire hole, there was no evidence to support this theory. All of the evidence before the Board led to one conclusion. The most likely cause of the Hazelwood mine fire was embers spotting from one or both of two bushfires outside the mine.

There is difficulty in determining with precision which of the external fires was responsible for the spotting of embers into the mine. On the evidence provided, spotting from the Hernes Oak fire was the more likely cause of the Hazelwood mine fire, while spotting from the Driffield fire may have also contributed. Both the Hernes Oak fire and the Driffield fire are regarded by Victoria Police as suspicious and both are the subject of ongoing investigation.

The probability of embers spotting into the Hazelwood mine was supported by clear evidence from several mine employees, contemporaneous photographs and video, expert evidence and computer simulations of likely fire behaviour on 9 February 2014.

The origin and circumstances of the Hazelwood mine fire are considered in Chapter 2.1 of the report.

FIREFIGHTING RESPONSE

FIGHTING THE HAZELWOOD MINE FIRE

In combatting the Hazelwood mine fire, GDF Suez personnel and contractors and the Country Fire Authority (CFA) were faced with the formidable task of extinguishing a huge fire that had an unlimited supply of fuel. That the CFA was able to develop and implement an effective suppression strategy and

successfully extinguish the fire when it did, without interruption to Victoria's power supply, is a tremendous achievement. GDF Suez personnel must also be acknowledged for their hard work in extremely difficult circumstances throughout the period the Hazelwood mine fire burned.

However, fire services and GDF Suez have a lack of readily available equipment, such as compressed air foam systems relevant to best practice brown coal firefighting. Fire services and GDF Suez recognise that acquisition of best available technology for firefighting in coal mines is an area in need of improvement.

GDF Suez was responsible for the initial response to the mine fire on 9 February 2014. GDF Suez was successful in keeping the Driffield fire from crossing the mine's boundary at the Morwell River diversion. However, fire that did enter the Hazelwood mine quickly spread in the northern batters, the eastern batters, the south-eastern batters, and the mine floor. There were also multiple fires within the mine at grass level.

Mine personnel worked strategically to turn sprays on and off in the northern batters to create a fire-break between the worked out northern batters that were on fire and the western side of the northern batters near the operational areas of the mine. They were able to successfully defend the operational areas of the mine and the power station.

Despite these efforts, the initial response to the fire was inadequate in suppressing ember attack and containing spot fires that ignited in the mine at various locations on the afternoon of 9 February 2014.

Firefighting was significantly impeded by the fact that the reticulated fire services water system or 'fire service network' did not extend to large sections of the worked out areas of the Hazelwood mine where fires took hold.

By late afternoon on 9 February, firefighting efforts were further impeded by fire damage to the two SP AusNet 66kV power lines that run across the northern batters of the mine. This resulted in power loss to the two major water pumping stations, triggering a significant drop in water pressure in the fire service network. This not only inhibited the use of fixed water sprays, it hampered the ability to fill up fire tankers with water. Power loss also caused a temporary interruption to coal production and left the mine's Emergency Command Centre in darkness and staff unable to use equipment such as CCTV monitors and computers.

At the time of the Hazelwood mine fire there were no internal back-up power supply generators at the Hazelwood mine. However, mine electricians and others worked hard to eventually return power to the mine.

The fires were so widespread by early evening on 9 February that firefighting in the worked out areas of the mine was considered too dangerous, and firefighting was limited to suppressing the fires at grass level.

Fire services took command of the firefighting that evening. CFA personnel described a number of problems when they were initially deployed to the Hazelwood mine, such as difficulties and delays in trying to access and navigate the mine.

Planning of a suppression strategy was undertaken across incident, regional and state levels, with GDF Suez personnel continuing to contribute to the firefighting effort, and providing the CFA with information and escorts to assist with navigating the mine.

Five days into the fire, work commenced on installing approximately eight kilometres of extra fire service pipework in the worked out areas of the Hazelwood mine in order to assist the suppression effort.

Following consultation with an expert reference group 10 days into the mine fire, a new fire suppression strategy was implemented. The new strategy involved incrementally suppressing fire in 100 metre segments. This strategy was ultimately successful.

Water (applied by appliances with the assistance of Sikorsky helicopters), compressed air foam and thermal imaging cameras, were all used with considerable success. The use of compressed air foam is not a standard firefighting method employed by Victorian fire services, so large compressed air foam system units (CAFS) were borrowed from Tasmania and New South Wales. The use of CAFS reduced smoke and ash, which was important given that Morwell is so close to the northern batters of the mine.

By 10 March 2014, the mine fire was declared under control. After 45 days of fighting the fire, the Fire Services Commissioner declared the Hazelwood mine fire 'safe' on 25 March 2014.

Emergency services and GDF Suez invested enormous resources into the suppression of the Hazelwood mine fire. Up to 80 GDF Suez personnel worked on day shifts and about 50 worked on night shifts over the course of the firefighting effort. GDF Suez also contributed significant firefighting equipment.

Fire services supplied around 200 firefighting appliances, including aircraft, tankers, pumpers, ladder platforms, CAFS units, thermal imaging cameras, command vehicles and support vehicles. More than 7,000 emergency services personnel were involved in firefighting at the Hazelwood mine during February and March 2014. Firefighting personnel were drawn from the CFA, Metropolitan Fire Brigade (MFB), Department of Environment and Primary Industries (DEPI), State Emergency Service, Australian Capital Territory Fire and Rescue, New South Wales Fire and Rescue, Tasmanian Fire Services, Queensland Fire Service, GDF Suez and Air Services Australia.

Firefighting is discussed in detail in Chapter 2.3 of the report.

ADEQUACY AND EFFECTIVENESS OF THE STATE RESPONSE

The State was generally well prepared for the extreme fire weather conditions on 9 February 2014. Planning for the fire risks took place at state, regional and local levels.

However, the Board acknowledges that the Traralgon Incident Control Centre was put under significant pressure because a strategic decision was made at both regional and state levels not to set up the base Incident Control Centre in Yarram. That pressure was compounded by the slow delivery of requested additional firefighting resources. These resourcing issues left the Traralgon Incident Control Centre in the unenviable position of having to prepare for and deal with fire activity over a large area of Gippsland.

In light of the number of competing resource demands facing the State in the period 7 to 9 February 2014, the Board considers that the measures adopted by fire services were generally appropriate.

An Incident Emergency Management Team was formed to respond to local fire conditions prior to 9 February 2014. Members of the Incident Emergency Management Team included representatives from various support agencies, local government, businesses and the Central Gippsland Essential Industries Group (CGEIG) (of which GDF Suez is a member).

The Board heard evidence from the Incident Controller that on 8 February 2014, several computer models were produced showing the significant threat to the Hazelwood mine in the event that the Hernes Oak–McDonald's Track fire broke its containment lines. One model was relayed to GDF Suez personnel via the CGEIG. Unfortunately GDF Suez did not understand the significance of this model.

The Board considers that the CFA responded quickly and effectively to the breakout of the Hernes Oak and Driffield fires. No properties were lost in Morwell. The CFA was able to prevent fire from crossing the Morwell River diversion and entering the operating area of the Hazelwood mine.

Where possible, CFA resources were sent to the mine to assist in asset protection. During the afternoon of 9 February 2014, that assistance was necessarily limited due to the other demands on the CFA's firefighting resources.

In its submission to the Board, GDF Suez attributed part of the failure of the initial response to the Hazelwood mine fire to the limited firefighting assistance from fire services, and the demands on the CFA to attend to other fires in the Latrobe Valley.

The Board is satisfied that the way that emergency services allocated their resources to suppress fire on 9 February 2014 was consistent with the State Controller's Strategic Priorities, where the protection of life is paramount.

However, there is potential to improve the efficiency of communication and resource use between emergency services and operators of essential industries infrastructure working together under one integrated incident management team during major fires.

After the recent experience of the Hazelwood mine fire, the Victorian Government is considering various reforms to emergency management planning to better facilitate a consistent response across both public and privately owned land, to better cater for complex land use, and to take account of the diverse hazards of specific industries and facilities, like the Hazelwood mine.

Further reforms that the Victorian Government has committed to relate specifically to engagement and integration of emergency planning and management with the coal mining sector. The Board affirms these commitments.

The adequacy and effectiveness of the State's response to the Hazelwood mine fire is considered in Chapter 2.3 of the report.

ADEQUACY AND EFFECTIVENESS OF GDF SUEZ'S RESPONSE

The inability of GDF Suez to effectively suppress the Hazelwood mine fire during the initial stages was due in large part to the mine operator being inadequately prepared to manage the fire.

GDF Suez recognised the need for fire preparedness planning on 7 February 2014 upon the declaration of a Total Fire Ban for the area. Whilst fire plans were prepared, they were not updated once nearby bushfire started on the afternoon of 7 February 2014 and became a serious threat to the mine. Fire plans should have been reviewed and modified to reflect the changing and serious conditions.

The fire plans also relied on the CFA being able to promptly respond to a fire in the mine. In light of the extreme weather conditions in the period prior to the Hazelwood mine fire and the likely pressures the CFA would be under, GDF Suez should have more closely liaised with the CFA to understand its resourcing and the likely threat to the mine.

GDF Suez should also have revised its assessment of staffing levels and other protective measures it planned to implement over the weekend. A key principle for success in fire suppression is a fast determined first attack, but the resources available for first attack of the Hazelwood mine fire were insufficient to prevent the spread of fire inside the mine.

Once the Emergency Response Plan took effect, clear command and control structures were established. However, all but one of the GDF Suez personnel nominated as an Emergency Commander by the Emergency Response Plan were out of Morwell on a weekend break or holiday. The person asked to step into the role of the Emergency Commander during the Hazelwood mine fire was not designated that role in the Emergency Response Plan.

The Board acknowledges that several members of GDF Suez management, concerned about the impact of any fire on the mine, came into the mine before the fires took hold and were involved in key decision-making in the early afternoon of 9 February. GDF Suez also rapidly increased the number of personnel present at the mine to assist once the mine fire took hold.

Additional staff present at the mine prior to the outbreak of fire would have been beneficial to firefighting efforts. The Board affirms GDF Suez's commitment to ensuring that more personnel are rostered on and additional contractors are available for dedicated fire protection duties on predicted extreme fire danger days.

GDF Suez personnel failed to activate the mine's Emergency Response Plan until more than an hour after fire was first reported. Several consequences appear to have arisen from that initial failure.

There was no evidence that anyone within the mine notified the CFA of the fires by calling 000. Whilst calls were made to the local Incident Control Centre during the course of the afternoon on 9 February, it does not appear that any request for CFA resources was made until several hours after the fire started. Firefighting resources in the area were attending other fires and may not have been able to assist any earlier, but early intervention and support at State level could have enhanced the local response.

The adequacy and effectiveness of GDF Suez's response to the Hazelwood mine fire is considered in Chapter 2.3 of the report.

FIRE RISK MANAGEMENT

In addition to inquiring into and reporting on the response to the Hazelwood mine fire, the Board was tasked with assessing the adequacy and effectiveness of the application and administration of relevant regulatory regimes in relation to the risk of fire at the Hazelwood mine.

Fire risk management currently occurs at state, regional and local levels.

FIRE RISK MANAGEMENT AT THE STATE LEVEL

The State manages fire risk, relevant to the Hazelwood mine in two distinct ways:

- through the emergency services agencies that are responsible for responding to and protecting property from fire, which operate under an overarching state-level emergency management framework
- through agencies which directly regulate coal mines and are able to influence the fire management policies adopted by mine operators.

EMERGENCY MANAGEMENT

Victoria has a multi-agency framework for emergency management, some elements of which are legislated and other elements of which are established by agreement.

From 1 July 2014, new governance arrangements came into effect, including the creation of the role of Emergency Management Commissioner, which succeeds the role of the Fire Services Commissioner. The Emergency Management Commissioner will have a broader oversight, control and coordination role in relation to emergencies.

Under the emergency management arrangements in place at the time of the Hazelwood mine fire, the Fire Services Commissioner had overall control of response activities to a 'major fire' in any area of Victoria. The Fire Services Commissioner is supported by the CFA, the MFB and DEPI, depending on the location of the fire. The CFA is responsible for responding to fires on private land within the country area of Victoria, such as the Hazelwood mine.

Over recent years, the CFA has invested in improved firefighting capability in the Latrobe Valley through the acquisition of aerial appliances, modernisation of its firefighting fleet and recruitment of additional firefighters at local CFA brigades. Local CFA brigades comprise both career and volunteer firefighters. When a fire situation escalates or resources are allocated to other fires, brigades may be called in from across the Latrobe Valley.

Victoria adopts a three-tiered approach to emergency management with State, Regional and Incident Controllers responsible for the command and control of different emergency response teams.

Emergency response plans are also prepared at each of these levels.

The allocation of resources for response to fires is governed by Standard Operating Procedures jointly issued by the Fire Services Commissioner, CFA, MFB and DEPI. These procedures aim to ensure that there are Incident Management Teams, headed by an Incident Controller, pre-positioned to manage major bushfires or potential major bushfires. The Incident Controller and Incident Management Team manage bushfire response activities from Incident Control Centres across the State.

The State is able to engage with support agencies and relevant community members in planning and managing an emergency by forming an Incident Emergency Management Team. An Incident Emergency Management Team brings together those responsible for command, control and coordination at the incident level, and community members and other relevant agencies. The Incident Emergency Management Team provides the forum for the Incident Controller to be informed about the likely impacts and consequences of an emergency and enables all members to contribute to the development of the overall incident strategy.

These arrangements generally functioned well during the Hazelwood mine fire, although the Board has made recommendations for improvement, noting that the emergency management framework is already undergoing significant reform.

Important background regarding the emergency management framework and a discussion of the adequacy and effectiveness of State planning for the Hazelwood mine fire can be found in Chapter 2.2 of the report.

REGULATION OF VICTORIAN COAL MINES

Regulation of Victorian coal mines is complex and has evolved considerably over time.

The principal regulatory mechanisms that govern the risk and prevention of fire at the Hazelwood mine are mine licensing laws, which are administered and enforced by the Earth Resources Regulation Branch of the Department of State Development, Business and Innovation (the Mining Regulator) and occupational health and safety (OHS) laws, which are administered and enforced by the Earth Resources Unit of the Victorian WorkCover Authority (VWA).

From 1 January 2008, responsibility for oversight of OHS matters in Victorian mines transferred from the Mining Regulator to VWA. From this date, the Mining Regulator no longer considered itself to have any role in regulating fire risk at the Hazelwood mine.

The Mining Regulator and VWA each adopted a narrow reading of the statutory regime underlying their respective areas of responsibility. Contrary to arrangements between the Mining Regulator and VWA, which contemplated collaboration and consultation on areas of overlapping responsibility, such as public safety risks, the agencies operated in silos. The Board was concerned that the manner in which the transition for OHS responsibility to VWA was effected meant that expertise and knowledge relevant to assessing fire risk at the Hazelwood mine was potentially lost.

The combination of these factors resulted in a gap in regulation of the Hazelwood mine in respect of fire risks with the potential to impact on Morwell and surrounding communities, such as that which manifested in 2014. The Hazelwood mine fire was a foreseeable risk that slipped through the cracks between regulatory agencies. This reality must be confronted if similar incidents are to be avoided in the future.

The Mining Regulator doubted whether it had the necessary legislative power to regulate fire risk in Victorian mines, notwithstanding that the Regulator's statutory objectives include ensuring that the health and safety of the public is protected in relation to work being done under a mining licence. The position adopted by the Mining Regulator is not, in the view of the Board, the only interpretation open of the Mining Regulator's regulatory power. This uncertainty is likely to be resolved when legislative amendments enacted in February 2014 come into effect.

The Board was also concerned by aspects of VWA's oversight of fire prevention and mitigation practices at the Hazelwood mine. In carrying out routine audits of the Hazelwood mine's fire management policies, VWA appears to have placed undue focus on administrative or procedural compliance with OHS regulations, rather than ensuring substantive compliance. The Board considers that effective regulation must focus on substance rather than form.

Further, when it came to ensuring GDF Suez had adequately addressed fire risks associated with the Hazelwood mine that had the potential to significantly impact the community, but did not necessarily place workers' lives at risk, VWA did not intervene despite these kinds of risk being entirely foreseeable. VWA justified this approach by its overall strategy of focusing its limited resources on hazards that represent the greatest risk of multiple worker fatalities.

The principle underlying the OHS regime is that the primary obligation to manage risk at a work site rests with the employer. There are necessary constraints on how a government agency can allocate its resources, particularly when VWA is responsible for 250,000 Victorian workplaces. However, the Hazelwood mine fire has demonstrated that there are consequences of real import where the approach to regulation is overly passive.

The Board considers that the Mining Regulator and VWA both have a role in regulating fire risk in the Victorian mining sector. In order to fulfil their shared responsibilities effectively, the Mining Regulator

and VWA also need to be adequately equipped with staff that have the necessary expertise to monitor and enforce compliance with measures to mitigate fire risk.

Chapter 3.2 of the report contains an explanation of the regulatory regimes governing Victorian mines, as well as an analysis of the adequacy and effectiveness of those regimes and their administration and enforcement by government agencies.

FIRE RISK MANAGEMENT AT THE REGIONAL LEVEL

At a regional and municipal level, there are a number of regulatory mechanisms in place to address fire risk. Obstacles have inhibited each of these mechanisms from effectively mitigating fire risk at the Hazelwood mine.

LAND USE PLANNING

A principal means by which fire risk can be managed at the municipal level is through land use planning schemes. Land use planning can play a significant role in the management of fire risk by regulating how land may or may not be used or developed. Existing patterns of land use in the Latrobe Valley pose some challenges for the mitigation of fire risk. The Latrobe Valley has inherited land use planning decisions that have resulted in a significant gap between the fire protection policies and strategies outlined in the Latrobe Planning Scheme and the reality of land use in the vicinity of the Hazelwood mine.

The Latrobe City Council is the authority responsible for the administration and enforcement of the Latrobe Planning Scheme, which comprises both state-wide and local planning provisions.

The Latrobe Planning Scheme applies a number of strategies to manage bushfire risk and inappropriate development with respect to coal mines in the Latrobe Valley. However, these strategies are limited by the fact they only operate prospectively and have little capacity to deal with past decisions in relation to existing uses of land.

Most notably, there is no buffer zone between the Hazelwood mine and the town of Morwell. The implementation of the buffer zone requirements post-date the approval (in the 1940s) of a new open cut mine adjacent to Morwell. The Latrobe City Council is powerless to enforce any buffer zone within the boundaries of the mine licence. Under legislation, this is the province of the Mining Regulator.

The Board's attention was also drawn to the existence of three timber plantations within 1,000 metres of the mine licence area. In a landscape that has largely been cleared of native vegetation, timber plantations are a potential source of fuel for a bushfire and can create embers that are carried long distances.

Although the Latrobe Planning Scheme currently provides that a permit is required for timber plantations this close to the mine, for historical reasons each of these plantations exists without a permit.

GDF Suez submitted that the establishment of timber plantations close to the Hazelwood mine represented a fundamental failure in appropriate land use planning in the Valley. Information provided by the plantation owners after the conclusion of the Inquiry's public hearings paints a more complex picture in relation to both the establishment of the plantations and the risk they pose to the mine. These plantations do not represent the entire potential source of embers spotting into the mine. Other sources include trees and other vegetation, grasslands and trees planted on roads, and nearby rural land.

The Board agrees that it is not desirable that timber plantations be established in close proximity to an open cut coal mine without consideration of fire risk management, nor is it appropriate to extend an open cut coal mine towards existing timber plantations, apparently without regard to fire risk. There is considerable scope for improvement in the way that land use planning in the Latrobe Valley manages the risk of fire, particularly in the vicinity of open cut coal mines.

INTEGRATED FIRE MANAGEMENT PLANNING

Integrated fire management planning was introduced following the 2003 Esplin Report. It involves the collaboration of community, public and private land owners, utility providers, the State, councils, and industry. The development of integrated fire management plans in the Latrobe Valley presents an opportunity

to recognise that there are current sources of risk across the Latrobe Valley landscape, such as pre-existing plantations and roadside vegetation, and that these risks need to be managed with the most effective risk treatments available.

Fire risk management planning is currently occurring at the state, regional and municipal levels, and there is consistency between plans in the recognition of priority risks and assets.

At the regional level, the Gippsland Regional Strategic Fire Management Plan identifies coal mines in the region as assets at extreme risk of fire from external fire events, which have the potential to disrupt power supplies to the national grid. The regional plan identifies existing treatments that address this risk, including legislative controls, emergency management plans, on site firefighting resources and regulatory planning.

At the municipal level, the Latrobe City Council has produced a Municipal Fire Management Plan (as a sub-plan of the Latrobe Municipal Emergency Management Plan), which includes fire history information, assets at risk and control measures. The municipal plan's treatments for protecting assets are more operational, for example, the treatments listed for the Hazelwood mine include routine asset site maintenance and land use planning considerations for surrounding land use.

Regional and municipal plans are being developed with the involvement of a broad range of stakeholders. However, the Hazelwood mine and the mine's regulators are key players currently missing from the integrated fire management planning process. Further, the content of the plans, including the treatment of risks, is not known to the agencies that have oversight in those areas. Without an approach that involves the active engagement of all relevant entities, integrated fire management plans will not be adequate or effective.

There is a more fundamental weakness with the regional and municipal plans–it is unclear who is responsible for their implementation, and consequently, no one has taken responsibility. This must be addressed if integrated fire management planning is to be effective.

Legislation is required to give greater force to integrated fire management planning, and to clarify who is responsible for implementation of the plans. The establishment of clear statutory responsibility for the implementation of integrated fire management plans at the municipal, regional and state level is needed.

Establishing a clear line of sight to the responsible regulators for integrated fire management planning should ensure that the actions in the plans are implemented and monitored.

There are a number of problems with the Gippsland Regional Strategic Fire Management Plan. In these circumstances, the Board considers that the regional plan should be reviewed.

The adequacy and effectiveness of regulation of fire risk at the regional and municipal level is considered in detail in Chapter 3.1 of the report.

FIRE RISK MANAGEMENT AT THE HAZELWOOD MINE

Fire is an ever-present risk in a brown coal mine. The outbreak of fire can spread extremely quickly. It is therefore critical that there are effective means of both preventing the outbreak of fire and being in a position to rapidly extinguish fires that do occur.

GDF Suez has adopted a range of policies and procedures directed to the prevention, mitigation and suppression of fires. These have evolved considerably over time, and have been enhanced as a result of a process of investigating and reviewing fire incidents at the mine and ensuring that recommendations arising from those investigations are implemented where appropriate.

As a consequence of this process of continual improvement, the fire prevention and preparedness measures at the Hazelwood mine are well-suited to most kinds of mine fires. However, GDF Suez was not adequately prepared for a fire of the kind, severity and complexity of the Hazelwood mine fire. This was primarily because GDF Suez did not sufficiently recognise the risk of embers from a bushfire causing a major fire in the worked out areas of the Hazelwood mine, or the potential impacts such a fire might have on Morwell and surrounding communities.

Contrary to suggestions that the Hazelwood mine fire was the 'perfect storm of events', all of the factors contributing to the ignition and spread of the fire were foreseeable. Yet it appears they were not foreseen.

The Board notes that as significant as the fire was, conditions on the day of the fire's ignition could have been worse and the consequences of the fire could have been more severe.

A number of previous fires at the Hazelwood mine bear similarities to aspects of the 2014 Hazelwood mine fire. Fires occurred in December 2005 and September 2008, which took hold in worked out areas of the mine. Ease of access, location and reliability of water supply in worked out areas of the mine were identified as potential vulnerabilities. An incident investigation report into the September 2008 fire recommended that a risk assessment, including a cost/benefit analysis, should be undertaken concerning the risk of fire in worked out areas to determine if further prevention work was required.

This risk assessment was never undertaken.

The failure to conduct a proper risk assessment meant that an opportunity to substantially improve fire protection measures in the worked out areas of the mine and potentially avoid or reduce the severity of the 2014 Hazelwood mine fire was lost.

In not properly identifying hazards associated with a fire in the worked out areas of the Hazelwood mine and the risks to the Morwell and surrounding communities, GDF Suez fell short of its obligations under OHS laws. GDF Suez also failed to adopt reasonably practicable risk control measures to eliminate or reduce the health and safety risks associated with a fire in the worked out areas of the Hazelwood mine.

GDF Suez's main strategy for preventing the outbreak of a mine fire as a result of an external fire has been vegetation management in the rural land surrounding the Hazelwood mine. This can be an effective strategy against a direct firefront, but it does not address the risk of mass ember attack into the Hazelwood mine from external sources resulting in widespread simultaneous ignitions.

The Board heard expert evidence that the Hazelwood mine could only be effectively protected from an external ember attack by either wetting down coal faces or covering exposed coal with earth or some other fire retardant substance.

GDF Suez has its own firefighting infrastructure, plant and equipment, as well as personnel and contractors trained in firefighting who can be called upon in the event of an emergency. The Hazelwood mine features a fire service network, consisting of an extensive pipe network powered by a series of electric pumps, which supplies water to sprays, hydrants and tanker filling points throughout the mine. The fire service network functions both as a means of fire prevention, by allowing wetting down of coal faces on days of high fire risk, and of fire response, by providing a supply of water for firefighting hoses, filling tankers and fixed sprays during firefighting.

During the period from around 1994 until around 2007, degraded or leaking pipework was progressively removed from the fire service network in worked out areas of the Hazelwood mine, principally in an area of the northern batters which was significantly affected by the Hazelwood mine fire in 2014. Prior to the Hazelwood mine fire, the pipework had not been replaced and no risk assessment was conducted to determine whether it should have been.

The removal of this pipework meant that large areas of coal were not covered by either earth or water and were completely exposed. So long as these areas were within five minutes travel from a tanker filling point or hydrant manifold, GDF Suez continued to meet the minimum requirements of its own fire management policies. Tanker filling points and hydrant manifolds are much more relevant to fire suppression than prevention, but in any event proved inadequate for that purpose during the Hazelwood mine fire. Limited reticulated water supply in the northern, eastern and south-eastern batters also severely hampered suppression efforts during February 2014, to the point where extensive pipework had to be installed during the fire. CFA volunteers also described problems with locating and accessing tanker filling points and hydrant manifolds.

In effect, reliance on the minimum requirements under GDF Suez's fire management policies meant that there was no preventive measure in place to protect the worked out areas from ember attack.

While rehabilitation is a routine method of covering exposed coal that could be used as a fire prevention method, there are various factors that make progressive rehabilitation a complex, costly and time-consuming exercise. These obstacles are a real impediment to relying on rehabilitation as the primary

strategy for fire prevention throughout the worked out areas of the Hazelwood mine, although it should be considered as one of the suite of preventive measures available.

There are a range of other potential methods for covering exposed coal in worked out areas of the mine. Clay, a stabilised clay and cement mixture such as 'shotcrete', fly ash slurries, foams, gels, organic surfactant materials, polymers and bituminous tar were all raised as potential alternatives to rehabilitation.

Each of these options has advantages and disadvantages. None of the methods appears to have been trialled for this particular application in open cut brown coal mines and may not be suitable for the Hazelwood mine. It is therefore not appropriate for the Board to advocate for any one option without the benefit of proper technical assessment of the feasibility of the measures and a thorough risk assessment that includes a cost/benefit analysis. In reality, the most reasonably practicable control adopted by GDF Suez will probably involve a combination of methods depending on the particular area of the mine.

There are also areas for enhancing fire preparedness measures at the Hazelwood mine. The major area of concern is the lack of back-up power supply or emergency generators available to supplement the mains power supplying the mine, and in particular, pumping stations for the fire service network and the Emergency Command Centre.

The Board considers that existing fire management measures GDF Suez has adopted are deficient in a number of other respects. For example, the vegetation management requirements applying outside the perimeter of the mine do not apply to the worked out areas and mine floor, heightening the risk of fire and hindering access by firefighters; and in worked out areas of the mine where fixed sprays do exist, there is no procedural requirement to wet down coal faces on high fire risk days.

GDF Suez has indicated it will review fire risk in the worked out areas of the mine and has already committed to a range of measures to enhance fire protection. The Board affirms these commitments.

Chapter 3.3 of the report contains a comprehensive discussion of the adequacy and effectiveness of measures taken by GDF Suez to prevent an outbreak of fire in the Hazelwood mine and to mitigate its spread and severity. For an analysis of measures taken by GDF Suez to prepare for and to respond to fire, see Chapter 2.2.

HEALTH AND WELLBEING

From 9 February 2014 until 25 March 2014, the local community was overwhelmed by smoke and ash from the Hazelwood mine fire. People were affected in many ways. Smoke and ash produced by the Hazelwood mine fire resulted in a number of distressing adverse health effects for Morwell residents, some of whom may continue to be affected into the future. Many people and local businesses have also experienced financial impacts for a range of reasons.

While the CFA managed the response to the fire, the Environment Protection Authority (EPA), the Department of Health, and the Department of Human Services (DHS), together with the Latrobe City Council, responded to the fire's health and environmental impacts and led recovery efforts.

The EPA and the Department of Health were the key agencies responsible for providing the community with information about smoke and ash produced by the mine fire and possible adverse health effects. The Department of Health (with the assistance of DHS) set up a number of initiatives to provide respite and relief for the community throughout the event.

Chapter 4.1 of the report includes detailed background information relevant to the environmental and health management of the emergency and its impact on the local community, while Chapter 4.2 provides a chronology of key events.

ENVIRONMENTAL EFFECTS AND RESPONSE

When coal is burnt it produces a number of different pollutants. Pollutants emitted during the Hazelwood mine fire included carbon monoxide, particulate matter, nitrogen dioxide, sulphur dioxide, polycyclic aromatic compounds, volatile organic compounds, dioxins and furans, and metals. Particulate matter is a complex mixture of very small particles and liquid droplets that can combine to make dust, soot and

smoke. Exposure to both PM_{10} (particulate matter that is 10 micrometres or less in diameter) and $PM_{2.5}$ (particulate matter that is 2.5 micrometres or less in diameter) has been linked to adverse health effects.

The Hazelwood mine fire also produced a significant amount of ash. While this ash was not 'fly ash' it was nonetheless an irritant, and caused significant distress to the community.

The State Environment Protection Policy on Ambient Air Quality provides standards for key pollutants, which are used to monitor ambient air quality. Most of the key pollutants produced during the Hazelwood mine fire are subject to national compliance standards, with the notable exception of $PM_{2.5}$ for which there is only an advisory standard.

During the Hazelwood mine fire, Victoria's environmental regulator, the EPA, conducted air quality monitoring in Morwell and the surrounding areas. A variety of equipment was used at different locations to obtain relevant data, which was then provided to the Department of Health. The EPA also tested soil, ash and water during the mine fire.

There were three key time periods of significantly elevated levels of pollution (primarily $PM_{2.5}$ and carbon monoxide). These were 15–18 February 2014, 21–25 February 2014, and 26–28 February 2014. During these periods $PM_{2.5}$ levels were well above the advisory standard. A peak reading of $PM_{2.5}$ was recorded on 16 February 2014 when the daily average was approximately 28 times the advisory standard. Carbon monoxide levels were also significantly elevated during the three peak periods, for example on 16 February 2014 at almost four times the compliance standard.

Other pollutants, such as sulphur dioxide, nitrogen dioxide and ozone, were monitored during the mine fire; however they did not exceed compliance standards. The EPA also monitored volatile organic compounds. It found that benzene exceeded the standard at the Morwell Bowling Club on two occasions, and on one occasion at the Maryvale Crescent Preschool. Children were not at the facility at this time, but other residents were close by.

The Board commends the EPA for:

- its commitment to scientific rigour and scientific competence in analysing a large amount of complex air quality data sets in a short period of time
- working assiduously to overcome equipment deficiencies, and moving as swiftly as it could to obtain equipment from wherever it could
- the monitoring conducted from 20 February onwards at the Morwell Bowling Club
- seeking independent peer reviews about its response to the Hazelwood mine fire.

However, the State Control Centre's initial request for the EPA's support and advice in responding to the Hazelwood mine fire came too late and the EPA was ill-equipped to respond rapidly. The use of low cost, highly mobile equipment could have allowed monitoring to have commenced earlier in the critical period of the first week when the highest air polution concentrations were likely to have affected the community.

For a detailed discussion of the environmental effects and an examination of the EPA's role as a support agency during the Hazelwood mine fire, see Chapter 4.3 of the report.

HEALTH EFFECTS

Smoke and ash produced by the Hazelwood mine fire resulted in a number of distressing adverse health effects for Morwell residents, including sore and stinging eyes, headaches and blood noses. The majority of these health effects resolved when the fire was controlled, but some have persisted. Other community members have reported the development of new health conditions as a result of exposure to smoke and ash.

A number of vulnerable groups in the community were particularly susceptible to the adverse health effects of the smoke and ash, namely those with pre-existing cardiovascular and respiratory conditions, pregnant women and unborn children, children and the elderly. The Latrobe Valley has an ageing population with a higher incidence of cardiovascular and respiratory disease. The area also has a high percentage of low-income households and a higher percentage of residents who have a disability. As a result, the Hazelwood mine

fire added further insult to an already vulnerable community. To assist the community to recover from this incident and to improve health outcomes for the future, the Latrobe Valley should be the focus of renewed efforts to improve community health.

During the Hazelwood mine fire, the Department of Health undertook monitoring of the demand on health resources to assess the potential impact of smoke and ash on the community. Through this monitoring activity, the Department of Health determined that there was an initial increase in demand for general practitioners, however there was not a significant increase in attendances at emergency departments, or other hospital admissions during the period of the fire.

Several weeks into the fire, the Department of Health commissioned the Monash University School of Public Health and Preventative Medicine to undertake a Rapid Health Risk Assessment to provide information about the short-term health effects of the Hazelwood mine fire on the local community. The study concluded that the level of exposure to smoke and ash experienced by the community in Morwell would not be expected to cause any deaths if the level of exposure remained at that level for six weeks. However, the study was based on a standard Victorian population and was not adjusted for the poorer health status prevailing in Morwell.

The Board commends the Department of Health for commissioning the Rapid Health Risk Assessment of the potential health effects of the fire. However, the utility of the Rapid Health Risk Assessment would have been enhanced had the results been available earlier to inform the Department of Health's decision-making. It also would have been beneficial to provide the Rapid Health Risk Assessment findings to the community to address their request for more information about the potential adverse health effects of the exposure to smoke and ash.

There were serious concerns in the community about the potential long-term health impacts of exposure to smoke and ash from the Hazelwood mine fire. Understanding and managing the health and environmental impacts of the Hazelwood mine fire is challenging, as the health effects of medium-term exposure to smoke and ash from a fire in a coal mine are not known.

A primary concern, from a long-term health perspective, is the duration for which residents were living with ashy, smoky conditions. The Board heard expert evidence that people with pre-existing cardiovascular and respiratory conditions are particularly susceptible to potential adverse long-term health effects when exposed to ozone, $PM_{2.5}$ and larger particulates. In particular they are susceptible to an aggravation or progression of their underlying condition, an increased risk of lung cancer and potential effects on coagulation, which could result in an increased risk of arrhythmias, morbidity, hospital admissions and death. There was also a risk that the general population could develop medium to long-term effects from the exposure to $PM_{2.5}$ and ozone, including but not limited to the development of respiratory conditions, effects on cardiac conduction, increased risk of heart attack, stroke and lung cancer, long-term cognitive decline and psychosocial effects.

Chapter 4.5 of the report contains a more in-depth discussion of the health effects that the smoke and ash produced by the Hazelwood mine fire had on the community, the likely cause of these health effects, and potential long-term health impacts.

FIREFIGHTER HEALTH

The Board of Inquiry heard a number of concerns about the health risks faced by firefighters during the Hazelwood mine fire and received submissions that the CFA, MFB and GDF Suez failed to recognise the potential health risks to those involved in the fire operations, particularly from exposure to carbon monoxide.

Over the course of the Hazelwood mine fire, numerous firefighters from emergency services and GDF Suez required medical treatment. Fourteen emergency service firefighters and 12 GDF Suez staff presented to hospital due to exposure to carbon monoxide, however none required admission. A firefighter was admitted to hospital due to a cut that subsequently became infected and another firefighter was injured activating a water spray in the mine. Several firefighters required first aid at the mine throughout the fire.

Fire services were initially inadequately prepared to respond to the hazardous conditions produced by the Hazelwood mine fire, particularly the risk of firefighters being exposed to elevated levels of carbon monoxide, which is lethal in high concentrations.

Protocols about the protection of firefighters from the risks of exposure to carbon monoxide were not implemented until late in the evening on 9 February 2014, by which time firefighters had already been exposed to increased levels of carbon monoxide.

The Draft Carbon Monoxide Regional Operating Procedure (developed in 2006 by the CFA) was then utilised, with additional measures subsequently incorporated to form a Health Management and Decontamination Plan. The Board considers that the Health Management and Decontamination Plan did not take into account that some firefighters may have had pre-existing conditions such as cardiovascular disease, which would have put them at an increased risk of adverse health effects from carbon monoxide exposure. The Board considers that it is important that all firefighters, including volunteers, are provided information about the potential risks involved in firefighting so that they can make informed choices. It is concerning that the Carbon Monoxide Regional Operating Procedure has remained in draft form since 2006.

GDF Suez had a carbon monoxide procedure in place to manage the risk of exposure to carbon monoxide during a mine fire. However, the Board considers it did not provide adequate protection to the mine's firefighters and operational staff from potential carbon monoxide exposure. If not for GDF Suez subsequently adopting the Health Management and Decontamination Plan utilised by emergency services, carbon monoxide exposure would not have been detected until firefighters began to exhibit symptoms, which may have put them at risk of significant adverse health effects.

The immediate health risks to firefighters during the Hazelwood mine fire and the methods employed to minimise these risks are described in further detail in Chapter 4.4 of the report.

HEALTH RESPONSE

The health response to the Hazelwood mine fire was led by the Department of Health with the assistance of the EPA. The Department of Education and Early Childhood Development and the Latrobe City Council managed the health response for schools and children's services.

The Inquiry revealed that the response to poor air quality in the Latrobe Valley as a result of the Hazelwood mine fire was delayed and overly reliant on validated air data when indicative air data would have been sufficient to inform health advice. This was compounded by issues relating to the protocols relied upon by government agencies to assist their decision-making.

One such protocol was the Bushfire Smoke Protocol, jointly developed by the EPA and the Department of Health in 2006/2007. During the Hazelwood mine fire, the EPA issued 58 advisories in accordance with the Bushfire Smoke Protocol via media releases. These advisories also included general advice about actions to reduce health impacts caused by smoke. However, the advisories were generic and repetitive and did not provide actionable advice for the community to respond to varying levels of smoke. The Bushfire Smoke Protocol should be reviewed and amended to provide practical, clear and user-friendly advice.

During the mine fire two further joint protocols were developed to help inform decision-making and advice to the community about increased levels of carbon monoxide and $PM_{2.5}$ in the air: the community Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol.

The Board commends the EPA and the Department of Health for their commitment to developing and obtaining peer reviews of the community Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol. However, because they were only developed during the mine fire, they could not be used to protect the community in the early stages of the fire.

In particular, the $PM_{2.5}$ protocol was not developed until 25 February 2014, by which time the local community had already been subjected to elevated levels of $PM_{2.5}$ for more than two weeks.

After 25 February 2014, levels of $PM_{2.5}$ started to increase again, which prompted the Chief Health Officer to advise on 28 February 2014 that vulnerable groups (preschool aged children, pregnant women, people with pre-existing cardiovascular and respiratory conditions and people over 65 years) temporarily relocate from the area south of Commercial Road in Morwell. Based on the information provided, the Board considers that this temporary relocation advice was provided too late. Further, the basis for limiting the advice to those in vulnerable groups living south of Commercial Road was poorly explained and was perceived by the community as arbitrary and divisive.

The absence of a carbon monoxide protocol in the early stages of the fire meant the response of the EPA, CFA and Department of Health to high carbon monoxide levels lacked coordination and integration. On 15 February 2014, elevated carbon monoxide readings motivated the CFA to issue a 'Watch and Act' alert warning residents close to the Hazelwood mine to shelter indoors immediately and close all windows, doors and vents. The Department of Health was not involved in the decision to send the alert and did not consider it necessary or helpful. It also conflicted with health advice the Department was providing to the community at that time.

Worrying carbon monoxide levels continued to be detected on 16 February 2014. The Department of Health considered these detections to be 'spot readings' and not sufficiently reliable to inform public health advice. The Department of Health therefore decided not to issue any warnings or advice to the community. Yet if these readings were averaged over a four hour period they were high enough to warrant at least a 'Watch and Act' alert. The Board was informed that no adverse health effects from community exposure to carbon monoxide were detected on or after 16 February 2014.

The Board considers it unfortunate that the Department of Health did not have in place a pre-existing carbon monoxide protocol to provide advice to the community about elevated levels of carbon monoxide. The Board is of the view that the State should give further consideration to improving advisory mechanisms for public health emergencies.

The Board is concerned that acute exposure standards, used as a basis for the community carbon monoxide protocol, are too high according to international experts and should be reviewed. Furthermore, inconsistencies between the community carbon monoxide protocol and the firefighter carbon monoxide protocol meant that levels that were not considered safe for firefighters and required evacuation, did not require the same response if the level was measured in the community. This inconsistency in the protocols was not satisfactorily explained to the Board and remains of concern.

Following the establishment of the Inquiry, the Victorian Government signalled it intended to incorporate the Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol documents into a single operational document. It also intends to develop a State Smoke Plan covering the management of potential public health impacts from large scale, extended smoke events such as bushfires, planned burns, brown coal mine fires or industrial (hazardous material) fires.

The Board affirms this proposal, and recommends that the State Smoke Plan be incorporated into a State Smoke Guide, which would consist of a comprehensive suite of documents and support materials that could be used to minimise the harmful effects of smoke in the community.

A number of additional measures were put in place to provide health information and support to the community during the Hazelwood mine fire. These include the establishment of a community respite centre and a health assessment centre.

The Board commends the Department of Health for the development of a health assessment centre. The centre provided the community with an additional resource to provide health information, guidance and reassurance. Although, the effectiveness of the centre would have been enhanced if local general practitioners had visited the centre to demonstrate their support and to reassure the community that appropriate measures were in hand.

In terms of the longer-term health response, the toxic nature of smoke from the Hazelwood mine fire has raised community and medical concerns that there will be ongoing physical and mental health implications. The Department of Health has agreed to fund a long-term and wide ranging health study. This is not a decision that would have been taken lightly—there are few examples in Australia of long-term studies linked to an environmental disaster.

The Board agrees a long-term study would be an extremely useful predictive tool to assist with understanding future risks, and to prevent or reduce the chances of adverse health effects arising from similar situations in the future. However, all efforts ought to be made to extend the duration of the study to at least 20 years given the long lead times of some potential pollutants and the fact that young children were susceptible to the impacts.

Although there are many excellent health services in the Latrobe Valley and visits to those services increased during the mine fire, there was not a coordinated whole of health sector approach. There is a strong case for the health of the population of the Latrobe Valley to be substantially improved. Based on current health status information, this was justified before the Hazelwood mine fire and is even more necessary now. In the view of the Board, consideration ought to be given to potential avenues to achieve better outcomes for the region, such as the creation of a health conservation zone and the appointment of an independent health advocate.

The adequacy and effectiveness of the health response to the Hazelwood mine fire is considered more comprehensively in Chapter 4.6 of the report.

RELIEF AND RECOVERY

During the Hazelwood mine fire, the Latrobe City Council, government agencies and GDF Suez delivered a range of relief and recovery initiatives. These included respite and relocation payments to eligible Morwell residents, clean up kits and financial assistance for professional cleaning services, and financial assistance for businesses.

At community consultations and in written submissions, there was widespread criticism of the timing, adequacy and eligibility criteria for these initiatives.

In accordance with the emergency management arrangements in effect at the time of the Hazelwood mine fire, both DHS and Latrobe City Council had a role in planning and coordination of relief and recovery, with the Council largely responsible for local operational delivery. This led to community confusion regarding their roles and responsibilities.

For example, it is apparent from community consultations that the community was not clear about the decision-making and funding process for the clean up. The Board agrees with Latrobe City Council that improved systems of coordination and communication are required in emergencies of this type. The Board recognises that emergency management reforms underway in Victoria are likely to assist with achieving this objective.

Based on information before the Board, it is apparent that the Latrobe City Council worked hard to implement relief and recovery measures, and to advocate on behalf of the community for adequate clean up packages.

While acknowledging that clean up assistance has not previously been provided by the Victorian Government to households after floods and bushfires, the Board considers the self-clean package was inadequate to the scale of the cleaning task faced by community members. The clean up assistance package for Morwell was not announced until 18 March 2014 and there were further delays in implementing the assisted clean up package. This diminished the usefulness of the package as many people had already made their own cleaning arrangements.

DHS developed tailored relief payments to meet the needs of the residents of Morwell, in particular residents who were advised to temporarily relocate. However, there was confusion about eligibility requirements regarding the respite and relocation payments and flaws in communication, which caused distress in the community. The relief payments created divisions in the local community that have impeded recovery. The Board recognises and supports the decision by DHS to review its programs and guidelines for consistency and clarity of purpose. The Board also supports the Victorian Government's proposal to implement new technology for recording emergency assistance payments.

The Victorian Government, through the Department of State Development, Business and Innovation, has provided considerable support and assistance for small businesses in Morwell affected by the mine fire. Financial assistance was made available through the Morwell Business Relief Fund and a range of other practical support was also available. GDF Suez has provided additional stimulus to Morwell retailers through its 'Revive Morwell' initiative and Community Social Capital grants.

The Board affirms the Victorian Government's commitment to support local councils through Local Government Victoria. In particular, the Board supports developing formal and informal networks between emergency management officers and a resource base that Local Government Victoria can work closely

with during the response and recovery phases. The proposal for Local Government Victoria to coordinate emergency management officers across local councils is an appropriate approach.

For further exploration into the relief and recovery measures taken to support the Latrobe Valley community during and after the Hazelwood mine fire, see Chapter 4.7 of the report.

COMMUNICATIONS

The CFA, EPA, the Department of Health, DHS and the Latrobe City Council were primarily involved in informing the community about the mine fire, its effects and the response taken. A number of community organisations assisted by providing information to the community. Communications from GDF Suez were noticeably absent over the 45 days that the mine fire burned.

Feedback from the community consultation process, public submissions and evidence at public hearings pointed to significant shortcomings by government authorities, as well as GDF Suez, in communicating throughout the emergency. Throughout the 45 days that the fire burned, members of affected communities felt they were not listened to and were not given appropriate and timely information and advice that reflected the crisis at hand and addressed their needs.

Members of the community also reported that lack of coordination among the agencies involved in managing and responding to the mine fire resulted in confusing messages, with agencies appearing to contradict each other. This left affected communities struggling to find the answers and reassurance they were seeking. According to one expert, members of the community were suffering 'cognitive dissonance': what they were being told by health and environmental authorities was not what they were experiencing. A major factor contributing to the community's disengagement was the State's initial mischaracterisation of the mine fire as simply a fire emergency, when in fact it evolved into a chronic technological disaster. It then became a significant and lengthy environmental and health crisis.

The Board acknowledges that all government agencies worked under a great deal of pressure to try to ensure that the community received appropriate information. There were a number of examples of commendable efforts by government agencies, the Latrobe City Council, volunteer organisations and individual residents to keep the community informed.

Unfortunately, communication responses overall did not reflect international best practice for crisis communication. Communication did not reach many people in a timely way and in some cases, not at all. Communication was largely one-way with information being transmitted, but not received or understood by the intended recipients. An over-reliance on digital technology, particularly early on, hindered the message reaching all community members. Empathy was also often lacking, particularly from some government spokespeople.

Government departments and agencies did not engage to any significant extent in listening to, or partnering with local residents and community groups. One way of addressing this is to deploy community relations specialists during an emergency to work with previously identified trusted networks and act as an interface between communities and the providers of information and services.

The Board has made several recommendations for enhancing communications in the future. The State is conscious of the need for significant improvement and has already committed to a number of actions, as demonstrated by the communication principles included in the Victorian Emergency Management Reform White Paper and the Victorian Government's new governance arrangements for emergency management in Victoria through Emergency Management Victoria. The issues raised by this Inquiry and the recommendations of this report should be reflected in crisis communication policy and procedures within the new emergency management framework.

The adequacy and effectiveness of communications employed during the Hazelwood mine fire is considered in depth in Chapter 5 of the report.

The Board hopes the work undertaken through and by this Inquiry will assist to prevent a disaster like that of February and March 2014 from ever happening again.

RECOMMENDATIONS

The Hazelwood Mine Fire Board of Inquiry makes 18 recommendations.

These recommendations have been drafted taking into account issues raised by the Latrobe Valley community and the feasibility of implementation.

The term 'State' is used broadly in the recommendations to refer to the Victorian Government, the Victorian public service, and public entities such as Emergency Management Victoria, the Country Fire Authority, the Environment Protection Authority and the Victorian WorkCover Authority.

Recommendations relevant to the State are generally not prescriptive in terms of the entity tasked with implementation.

Where the term 'GDF Suez' is used in these recommendations, this is intended to refer to the entity that can most appropriately implement recommendations in respect of the Hazelwood mine.

The Board's recommendations should be read alongside the Board's 'affirmations' which comprise the actions that the State and GDF Suez committed to undertake during the course of this Inquiry.

RECOMMENDATIONS TO THE STATE

RECOMMENDATION 1

The State empower and require the Auditor-General or another appropriate agency, to:

- oversee the implementation of these recommendations and the commitments made by the State and GDF Suez during this Inquiry; and
- report publicly every year for the next three years on the progress made in implementing recommendations and commitments.

RECOMMENDATION 2

The State establish, for any future incident, integrated incident management teams with GDF Suez and other Victorian essential industry providers, to:

- require that emergency services personnel work with GDF Suez and other appropriate essential industry providers; and
- implement the Australasian Inter-service Incident Management System.

RECOMMENDATION 3

The State enact legislation, to:

- require Integrated Fire Management Planning; and
- authorise the Emergency Management Commissioner to develop and implement regional and municipal fire management plans.

RECOMMENDATION 4

The State:

- bring forward the commencement date of s.16 of the *Mineral Resources (Sustainable Development) Amendment Act 2014* (Vic), to facilitate the requirement that approved work plans specifically address fire prevention, mitigation and suppression; and
- acquire the expertise necessary to monitor and enforce compliance with fire risk measures adopted by the Victorian coal mining industry under both the mine licensing and occupational health and safety regimes.

RECOMMENDATION 5

The State equip itself to undertake rapid air quality monitoring in any location in Victoria, to:

- collect all relevant data, including data on $PM_{2.5}$, carbon monoxide and ozone; and
- ensure this data is used to inform decision-making within 24 hours of the incident occurring.

RECOMMENDATION 6

The State take the lead in advocating for a national compliance standard for $PM_{2.5}$.

RECOMMENDATION 7

The State review and revise the community carbon monoxide response protocol and the firefighter carbon monoxide response protocol, to:

- ensure both protocols are consistent with each other;
- ensure both protocols include assessment methods and trigger points for specific responses;
- ensure GDF Suez and other appropriate essential industry providers are required to adopt and apply the firefighter carbon monoxide protocol; and
- inform all firefighters about the dangers of carbon monoxide poisoning, and in particular highlight the increased risks for those with health conditions and those who are pregnant.

RECOMMENDATION 8

The State review and revise the Bushfire Smoke Protocol and the $PM_{2.5}$ Health Protection Protocol, to:

- ensure both protocols are consistent with each other; and
- ensure both protocols include assessment methods and trigger points for specific responses.

RECOMMENDATION 9

The State develop and widely disseminate an integrated State Smoke Guide, to:

- incorporate the proposed State Smoke Plan for the management of public health impacts from large scale, extended smoke events;
- include updated Bushfire Smoke, carbon monoxide and $PM_{2.5}$ protocols; and
- provide practical advice and support materials to employers, communities and individuals on how to minimise the harmful effects of smoke.

RECOMMENDATION 10

The State should continue the long-term health study, and:

- extend the study to at least 20 years;
- appoint an independent board, which includes Latrobe Valley community representatives, to govern the study; and
- direct that the independent board publish regular progress reports.

RECOMMENDATION 11

The State review and revise its communication strategy, to:

- ensure all emergency response agencies have, or have access to, the capability and resources needed for effective and rapid public communications during an emergency; and
- ensure, where appropriate, that private operators of essential infrastructure are included in the coordination of public communications during an emergency concerning that infrastructure.

RECOMMENDATION 12

The State, led by Emergency Management Victoria, develop a community engagement model for emergency management to ensure all State agencies and local governments engage with communities and already identified trusted networks as an integral component of emergency management planning.

RECOMMENDATIONS TO GDF SUEZ

RECOMMENDATION 13

GDF Suez revise its Emergency Response Plan, to:

- require an increased state of readiness on days of Total Fire Ban;
- require pre-establishment of an Emergency Command Centre;
- require pre-positioning of an accredited Incident Controller as Emergency Commander; and
- require any persons nominated as Emergency Commander to have incident controller accreditation and proficiency in the use of the Australasian Inter-service Incident Management System.

RECOMMENDATION 14

GDF Suez establish enhanced back-up power supply arrangements that do not depend wholly on mains power, to:

- ensure that the Emergency Command Centre can continue to operate if mains power is lost; and
- ensure that the reticulated fire services water system can operate with minimal disruption if mains power is lost.

RECOMMENDATION 15

GDF Suez:

- conduct, assisted by an independent consultant, a risk assessment of the likelihood and consequences of fire in the worked out areas of the Hazelwood mine, and an assessment of the most effective fire protection for the exposed coal surfaces;
- prepare an implementation plan that ensures the most effective and reasonably practicable controls are in place to eliminate or reduce the risk of fire; and
- implement the plan.

RECOMMENDATION 16

GDF Suez:

- review its 'Mine Fire Service Policy and Code of Practice' so that it reflects industry best practice and ensures that, by taking a risk management approach, it is suitable for fire prevention, mitigation and suppression in all parts of the Hazelwood mine; and
- incorporate the revised 'Mine Fire Service Policy and Code of Practice' into the approved work plan for the Hazelwood mine.

RECOMMENDATION 17

GDF Suez adopt and apply the firefighter carbon monoxide response protocol.

RECOMMENDATION 18

GDF Suez improve its crisis management communication strategy for the Hazelwood mine in line with international best practice.

AFFIRMATIONS

During this Inquiry, the State and GDF Suez have expressed a commitment to undertake numerous actions in response to the Hazelwood mine fire. The State's commitments are included in its written submissions to the Inquiry. GDF Suez's commitments are included in its written submission to the Inquiry.

Some of the actions that the State or GDF Suez have committed to undertake directly address the Inquiry's Terms of Reference and the Board has responded to them in the text of the report. Where the State and GDF Suez have accepted responsibility for undertaking action that directly addresses the Terms of Reference, the Board has not duplicated this commitment with a recommendation. Where the Board considers that an undertaking does not go far enough, it has also made a recommendation.

Some actions that the State or GDF Suez have committed to undertake go beyond the Terms of Reference of this Inquiry, but they remain relevant to the Inquiry and mitigate against an event similar to the recent Hazelwood mine fire happening again. The Board notes that some of these actions are already being implemented.

The Board affirms the commitments listed below. Where there is an inconsistency, the Board's recommendation prevails.

The Board attaches similar weight to the commitments that are the subject of its affirmations as to its recommendations. As stated in recommendation 1, progress on the commitments the Board has affirmed should be monitored and accounted for on the same basis as the Board's recommendations.

THE BOARD AFFIRMS THE FOLLOWING ACTIONS THAT THE STATE OF VICTORIA INTENDS TO TAKE:

- The State develop a Strategic Action Plan to improve and strengthen Victoria's emergency management capability.
- The State establish Emergency Management Victoria as the new overarching body for emergency management in Victoria.
- The State establish an Emergency Management Commissioner to ensure that control arrangements are in place, and coordinate the response roles of relevant agencies' resources.
- The State establish Inspector General Emergency Management as the assurance authority for Victoria's emergency management arrangements.
- The State establish a Volunteer Consultative Forum for the Government to consult with volunteers and ensure their views are heard.
- The State implement actions set out in the White Paper on Emergency Management Reform to improve community awareness and education, and make information available during emergencies.
- The State strengthen industry engagement with the community.
- The State improve the State planning framework for emergencies.
- The State improve Government engagement with the coal mine sector regarding emergency management plans.
- The State improve integration of industry in the response to an emergency.
- The State improve training for career and volunteer firefighters to include lessons highlighted by the Hazelwood mine fire.
- The State improve OHS in emergency response to include lessons highlighted by the Hazelwood mine fire.
- The State develop an integrated emergency resource planning framework for the Latrobe Valley.

- The State review emergency management communications arrangements across Government commissioned by the State Crisis and Resilience Council, including consideration of:
  - (i) the roles and functions of emergency communications committees;
  - (ii) enhancing specialist crisis communications capability within Government;
  - (iii) the use of established local networks as a way to communicate during emergencies;
  - (iv) additional emergency communications training for Government employees; and
  - (v) developing a coordinated approach to the use of social media by Government during emergencies.
- The State conduct a National Review of Warnings and Information.
- The State review Environment Protection Authority (EPA) emergency protocols, incorporating lessons from the Hazelwood mine fire.
- The State clarify future expectations of incident air monitoring and scenarios, and determine the appropriate inventory of equipment.
- EPA to coordinate a meta-analysis, including smoke plume modelling, of air monitoring data and other relevant information collected during the Hazelwood mine fire to create a body of knowledge of the impacts of extended brown coal fire events.
- The Department of Health and EPA to undertake further development on the carbon monoxide and $PM_{2.5}$ protocols and an engagement and education program around environmental and health standards.
- EPA review its communications response and implement a structured community engagement process with the Morwell and surrounding communities.
- EPA will be monitoring $PM_{2.5}$ at all its fixed automatic air quality monitoring locations by the end of July 2014.
- The State will have an automatic air quality monitoring station in the south of Morwell for the next 12 months [to March 2015].
- The State review the State Environment Protection Policy for Ambient Air Quality.
- The State develop a State Smoke Plan covering the management of potential public health impacts from large scale, extended smoke events.
- The State undertake projects to understand health impacts and predict the movement of smoke from planned burning and bushfires.
- The State improve local engagement on health issues.
- The State improve communication around psycho-social support to communities affected by emergencies.
- The State commission a long-term study into the long-term health effects of the smoke from the Hazelwood mine fire.

- The State review the Personal Hardship Assistance Program and Implementation Guidelines for consistency and clarity of purpose.
- The State implement new technology for recording emergency assistance payments.
- Local Government Victoria coordinate emergency management officers across local councils.
- The State improve relief and recovery information available to Culturally and Linguistically Diverse communities.
- The State review relief and recovery communications and community engagement initiatives.
- The State prepare Regional Growth Plans.
- The State implement a risk-based approach for work plans.
- The State implement the Victorian Critical Infrastructure Resilience Strategy.
- The State enhance emergency risk mitigation planning.
- The State review the Latrobe City Municipal Emergency Management Plan.
- The State initiate a joint program for regulators, emergency service agencies and the Emergency Management Commissioner to assess the prevention and preparedness controls on sites across Victoria.
- The State establish an appropriate mechanism to monitor implementation of the actions set out in its submission and the Government's response to the Board of Inquiry's recommendations.

THE BOARD AFFIRMS THE FOLLOWING ACTIONS THAT GDF SUEZ INTENDS TO TAKE:

- GDF Suez nominate a group of staff to be trained in the Phoenix Rapidfire modelling tool prior to the 2014/2015 fire season.
- GDF Suez offer enhanced training prior to the 2014/2015 fire season and on an ongoing basis, to personnel who are intended to perform a role under the emergency command structure and relevant emergency service agencies.
- GDF Suez establish an emergency command structure at the mine to deal with Extreme Fire Danger Days.
- GDF Suez notify Country Fire Authority (CFA) of the identity and contact details of those personnel holding these roles.
- On Extreme Fire Danger Days, GDF Suez ensure more personnel are rostered on and additional contractors are available for dedicated fire protection duties.
- GDF Suez upgrade signage within the mine to make orientation easier for non-mine personnel.
- GDF Suez negotiate with SP AusNet regarding a feasibility study to upgrade the MHO substation from temporary to permanent standard.
- GDF Suez initiate a programme for reducing vegetation in the worked out areas of the northern batters to reduce fire risk commencing in the areas closest to Morwell.
- GDF Suez maintain and continue to use the additional pipe system located in the northern batters which was installed during the 2014 fire and install additional pipework as identified.
- GDF Suez conduct a review of the current pipework and condition in the areas of the mine other than the eastern section of the northern batters.
- On Extreme Fire Danger Days GDF Suez instigate wetting down of non-operational areas.
- GDF Suez nominate a representative to attend the meetings of the Municipal Fire Prevention Committee convened by Latrobe City Council.
- GDF Suez nominate designated people to be in attendance at the CFA Incident Control Centre during an emergency which threatens the mine.
- GDF Suez review its own communications protocol to ensure that during the response to a fire which is capable of impacting on the community, it is able to communicate messages to the community via any protocol adopted following the review by all agencies.
- GDF Suez work with Victorian WorkCover Authority (VWA) to review its Safety Assessment and Safety Management System in light of rr. 5.3.21 and 5.3.23 of the Occupational Health and Safety Regulations 2007 (Vic).
- GDF Suez develop a Carbon Monoxide management protocol for firefighter and mine employee safety prior to the 2014/2015 fire season, in consultation with VWA and CFA.
- GDF Suez undertake the rehabilitation set out in Exhibit 88 – Statement of James Faithful, annexure 5 and discuss the appropriate timing of each sequence of rehabilitation with the Department of State Development, Business and Innovation.

FUTURE PROPOSALS

The Board has not been able, in the time available, to explore all reform options in depth, or test good ideas against a cost/benefit analysis.

However, the Board does not want to narrow policy makers' vision, nor constrain the State and GDF Suez to the Board's recommendations, nor limit improvements to those that the State and GDF Suez have committed to undertaking over the course of this Inquiry.

With this in mind, the Board considers that the following proposals, which are referred to in the report, warrant further attention.

PROPOSALS WARRANTING SERIOUS CONSIDERATION

The State:

- Investigate amending the Latrobe Planing Scheme, through the Minister for Planning, advised by the Department of Transport, Planning and Local Infrastructure, and the Latrobe City Council. The purpose of these amendments is to ensure, so far as is reasonably practicable, that the risk of embers from external rural fires (in particular from timber plantations) entering open cut coal mines in the Latrobe Valley, is minimised.
- Create a Health Conservation Zone in the Latrobe Valley. The purpose is to improve significantly the health of the Latrobe Valley community by coordinating and integrating health services with responses which tackle the broader social and environmental determinants of health.
- Appoint a Health Advocate for the Latrobe Valley. The purpose is to provide a local health voice for the Latrobe Valley community that can win the trust of that community and be a sound source of advice, mediation and advocacy on health-related matters.
- Develop an advisory mechanism for public health emergencies to assist the Chief Health Officer and Emergency Management Commissioner. The purpose is to assist the Chief Health Officer and the Emergency Management Commissioner by providing advice on health and medical policies and protocols relevant to public health emergencies.

Image source *Keith Pakenham CFA Pix*

Image source *Herald Sun*

PART ONE
INTRODUCTION TO THE INQUIRY

INTRODUCTION TO THE INQUIRY

IMPACT OF THE 2014 HAZELWOOD MINE FIRE

The Hazelwood mine fire that began on 9 February 2014 was the largest and longest running mine fire in the history of the Latrobe Valley. The impact of the Hazelwood mine fire on the Latrobe Valley community has been significant. The fire burned for 45 days and for much of that time sent smoke and ash over the town of Morwell and surrounding areas.

As significant as the mine fire was, it could have been much worse. The weather conditions on 9 February 2014 could have been more extreme, with lower humidity levels. Had the wind not changed direction at the time that it did on 9 February 2014, a large firefront may have been propelled directly into the mine. If the township of Morwell was more densely populated, or had the fire burned for longer, adverse health effects could have been significantly worse.

People have been affected by the Hazelwood mine fire in many ways. First and foremost, the community's health has been adversely affected. Many people have been adversely financially affected for reasons including medical costs, veterinary costs, time taken off work, relocation from their homes, cleaning their homes and businesses and possible decreases in property value. A number of local businesses experienced a downturn.

The community has suffered stress, anxiety, anger and frustration. It is important to recognise that the impact of the Hazelwood mine fire felt by the community is ongoing and is different for each individual.

Volunteers who responded to the Hazelwood mine fire, including volunteer firefighters and other fire service personnel, local hospital and other healthcare staff, not-for-profit and community based organisations, and many individuals in the local community, worked tirelessly and went above and beyond what was expected of them throughout the course of this event.

The following people and organisations are commended for their efforts:

- The Country Fire Authority (CFA), the Metropolitan Fire Brigade (MFB), the Department of Environment and Primary Industries, the State Emergency Service (SES), GDF Suez fire crews, and fire crews from Queensland, New South Wales, Tasmania, South Australia, the Australian Capital Territory and New Zealand.
- Ambulance Victoria, Victoria Police, and the Latrobe City Council for coordinating a mass door knock of the 6,400 homes located in Morwell. The door knock was possible because of a large volunteer effort from a range of people and organisations including 33 other Victorian Councils (as far away as Ararat), the CFA, the MFB and the Red Cross.
- Latrobe City Council, with the support of the State and Commonwealth governments, for establishing a Community Information and Recovery Centre in Morwell.
- Not-for-profit organisations for providing meals, accommodation and services to firefighters and for supporting the community, fire services and health workers.
- Local community organisations, such as the Morwell Neighbourhood House, Ramahyuck District Aboriginal Corporation, Asbestos Council of Victoria and Gippsland Asbestos Related Diseases Support Inc., and other community organisations for providing support to the community throughout the mine fire.
- ABC local radio, local commercial radio and Voices of the Valley for assistance with communications.
- The residents of Morwell and surrounding towns who took the initiative to check on and support their neighbours and vulnerable people in their communities.

ESTABLISHMENT OF THE INQUIRY

THE BOARD

On 11 March 2014, Dr Denis Napthine MP, Premier of Victoria, announced an independent inquiry into the Hazelwood mine fire. On 21 March 2014, the Governor in Council officially established the Board of Inquiry. The Board is made up of the following members:

THE HONOURABLE BERNARD TEAGUE AO, CHAIRPERSON

The Honourable Bernard Teague AO was the Chair of the 2009 Victorian Bushfires Royal Commission from February 2009 to August 2010. He was a Supreme Court Judge from 1987 to 2008. During this period he chaired the Adult Parole Board and the Victorian Forensic Leave Panel. He was also a Council Member at the Institute of Forensic Mental Health. Prior to his appointment to the Supreme Court, he was a solicitor specialising in defamation and other civil law.

PROFESSOR EMERITUS JOHN CATFORD, BOARD MEMBER

Professor John Catford is the Executive Medical Director for Epworth HealthCare, the largest not-for-profit health service in Victoria. He is a registered medical practitioner with specialist qualifications in paediatrics and public health medicine. He has been a Professor of Public Health for thirty years and has held senior academic and health service management positions in Australia, the United Kingdom, and with the World Health Organisation. As Dean of Health and Medicine at Deakin University, Professor Catford led the development of the Deakin Medical School, which opened in Geelong in 2008. In 2011, he was appointed Vice President and Deputy Vice Chancellor (Academic) of Deakin University. Professor Catford has held numerous Board positions, including with the National Health and Medical Research Council, Diabetes Australia, and the National Heart Foundation. He is currently Chair of the Youth Support and Advocacy Service Board and Deputy Chair of the VicHealth Board.

MS SONIA PETERING, BOARD MEMBER

Ms Sonia Petering is a practising corporate lawyer. She is Chair of the Rural Finance Corporation of Victoria and a Director of the Transport Accident Corporation. Ms Petering served as an inaugural Director of Australia's first community bank owned by Bendigo Bank Ltd, and was also a member of the Grampians Wimmera Mallee Water Board. Educated in the Wimmera region, Ms Petering completed her law and commerce degrees at the University of Melbourne.

TERMS OF REFERENCE

Under the Terms of Reference, the Board is to inquire into, and report on, and make any recommendations that it considers appropriate in relation to the matters specified below:

1. The origin and circumstances of the fire, including how it spread into the Hazelwood Coal Mine.
2. The adequacy and effectiveness of the measures taken by or on behalf of the owner, operator and licensee of the Hazelwood Coal Mine to prevent the outbreak of a fire, and to be prepared to respond to an outbreak of a fire including mitigating its spread and severity, in the Hazelwood Coal Mine, including whether the owner, operator and licensee of the Hazelwood Coal Mine, or any person or entity acting on behalf of any of them:
    i. implemented the recommendations arising from reviews of previous events; and
    ii. in the opinion of the Board, breached or did not comply with the requirements of (or under) any relevant statute or regulation, including any notification or directive given under such statute or regulation and any code of practice, management plan or similar scheme, developed and/or implemented due to such requirements.
3. The adequacy and effectiveness of the application and administration of relevant regulatory regimes in relation to the risk of, and response to, fire at the Hazelwood Coal Mine.

4 The adequacy and effectiveness of the response to the Hazelwood Coal Mine Fire by:

i. the owner, operator and licensee of the Hazelwood Coal Mine;

ii. the emergency services; and

iii. other relevant government agencies, including environmental and public health officials, and, in particular, the measures taken in respect of the health and well-being of the affected communities by:

iv. informing the affected communities of the Hazelwood Coal Mine Fire and about its known effects and risks; and

v. responding to those effects on, and risks to, the affected communities.

5 Any other matter reasonably incidental to the matters specified in paragraphs 1 to 4.

HAZELWOOD MINE FIRE INQUIRY SECRETARIAT

The Hazelwood Mine Fire Inquiry Secretariat was established to support the work of the Board of Inquiry. The Secretariat was based at 20 Hazelwood Road, Morwell, the same location as the Community Information and Recovery Centre that was established during the Hazelwood mine fire.

The Secretariat was headed by Dr Elizabeth Lanyon and consisted of a small staff. Members of the Secretariat are listed in the Appendix. The Board thanks them for their dedication and commitment to meeting tight deadlines.

The Board thanks K&L Gates for their legal expertise, and for expert document management support.

COUNSEL ASSISTING

The Board was greatly supported by Counsel Assisting, Ms Melinda Richards SC and Mr Peter Rozen, who managed the hearings process, advised what documents should be summonsed or requested and tendered, selected witnesses, led evidence, and made submissions at the hearings in Morwell. Counsel Assisting also provided the Board with legal advice and guidance throughout the Inquiry. The Board thanks them for their insight.

ACKNOWLEDGMENTS

The Board of Inquiry sincerely thanks the Latrobe Valley community for their generous support of the work of the Board. In particular, the Board acknowledges the important role the community has played by sharing their personal experiences and local knowledge.

The Board acknowledges and thanks the following people and organisations for their time and cooperation in supporting the work of the Board:

- Latrobe City Council
- Gippsland Community Leadership Program Alumni
- Latrobe Community Health Service
- Latrobe Valley business owners, managers and staff
- Department of Justice – Gippsland Regional Office
- Mr John Drewett, State Electricity Commission of Victoria, Office of the Administrator
- Ms Chris Kotur and Mr Michael Henry – community consultation facilitators
- Gippsland Multicultural Services
- Rocket Surgery Films Pty Ltd
- Three's A Crowd
- Virtual Operations Support Team – social media monitors.

The Board thanks the Victorian Government Solicitor and his office, government departments and agencies, GDF Suez and its solicitors, King & Wood Mallesons, and all other parties, solicitors and counsel, for their assistance throughout the Inquiry.

THE BOARD'S APPROACH

The Board recognised that effectively undertaking its role depended on genuine engagement with the local community. From the first day the Inquiry was operational, the Board and the Secretariat sought advice from the local community in the Latrobe Valley about everything from the area and its history, to where to hold community consultations. The Board emphasised to the local community that it wanted the Inquiry to be as open and accessible as possible.

The Board has endeavoured to hear and understand the experiences of the people who were affected by the mine fire, in order to determine what went well and what did not go well in the response to the fire, and what could be done differently in the future to mitigate against a similar incident happening again.

In his opening remarks on the first day of the Board of Inquiry's hearings, Chairperson Bernard Teague said:

> The past six weeks have seen us listen to over 250 participants at 10 community consultations in Morwell, Moe, Churchill and Traralgon. Those consultations provided us with invaluable information. We have also received and read hundreds of written submissions, many of which provide extremely helpful guidance. We place great emphasis on openness. Our website reflects that.
>
> We encourage all to go to our website to look at three things:
>
> 1 the reports on the community consultations;
>
> 2 the submissions in which the media has already located several news stories;
>
> 3 …the statements of witnesses and a transcript of their testimony.
>
> During these hearings we will hear evidence from firefighters, from mine workers, from experts in many fields, from community members. We plan to listen to all of them with open minds.[1]

The Board, Counsel, members of the Secretariat and independent experts at their request, were also guided around the Hazelwood mine.

COMMUNICATIONS

Within two weeks of the Inquiry's establishment, and while the Hazelwood mine fire was still burning, an Inquiry phone number and website with details of the Board and the Inquiry's Terms of Reference, was set up. Shortly after, a twitter account (@minefireinquiry) was established to provide the community with information about key dates and events relating to the Inquiry. Social media monitoring indicated that content about the Inquiry was widely shared.

The Inquiry publicised community consultations through its website, newspaper advertisements, and flyers in community meeting places and at the Community Information and Recovery Centre. Over 6,000 flyers were delivered to individual mailboxes around Morwell inviting community members to participate in the consultations. The website was kept updated with summaries of the community consultations, copies of written submissions, and hearing transcripts and evidence.

During the course of the Inquiry, 12 media releases were sent out to local and state based journalists. The Inquiry received considerable coverage in local and state media and was also widely reported nationally and internationally. A number of journalists covered the public hearings and media outlets supplied a 'pool camera', which provided footage of the hearings to various television networks.

The Inquiry thanks the media for their coverage of the Hazelwood mine fire and the Inquiry.

COMMUNITY CONSULTATIONS

Consultation with the affected community played a very important role in this Inquiry. As part of the Inquiry process, it was a priority of the Board to first meet with and hear from the Latrobe Valley community.

Within the first week of the Inquiry being established, the Board announced that it would be conducting community consultations. The sessions were open to all members of the local community including individuals, business owners and non-governmental organisations from across the Latrobe Valley.

Ten community consultation sessions were held between 10 April 2014 and 8 May 2014 (See Figure 1.1).

Figure 1.1 Community consultations

Location	Date	Time	Number attended
Kernot Hall, Morwell	Thursday 10 April 2014	12.30 pm – 3 pm	52
Kernot Hall, Morwell	Thursday 10 April 2014	6 pm – 8.30 pm	29
Moe Town Hall, Moe	Friday 11 April 2014	9.30 am – 12 pm	22
Federation University Auditorium, Churchill	Friday 11 April 2014	1.30 pm – 4 pm	14
Kernot Hall, Morwell	Tuesday 15 April 2014	7 pm – 9 pm	60
Morwell Bowling Club, Morwell	Wednesday 16 April 2014	7 am – 9 am	18
Latrobe Performing Arts Centre, Traralgon	Wednesday 16 April 2014	11 am – 1.30 pm	20
Koori community – Nindedana Quarenook – Ramahyuck District Aboriginal Corporation, Morwell	Tuesday 7 May 2014	1 pm – 3.30 pm	11
Culturally and Linguistically Diverse community – 20 Hazelwood Road, Morwell	Tuesday 7 May 2014	4 pm – 6 pm	24
Community service providers – Morwell Club, Morwell	Wednesday 8 May 2014	7 am – 9 am	14
Total attendees			**264**

The community consultation model used by the Inquiry was adapted from the model used by the 2009 Victorian Bushfires Royal Commission. The consultation process encouraged community members to discuss their experiences, stories, views and opinions amongst themselves, with Board members listening to these discussions. An independent facilitator led each session.

At the community consultations participants were asked to work together and consider three questions:

1 What worked well?

2 What did not work well?

3 What could be done differently in the future?

Scribes were appointed from each table to take notes of the conversations on behalf of the Inquiry. They were drawn from the Inquiry's Secretariat staff and alumni of the Gippsland Community Leadership Program, who assisted on a voluntary basis.

At the conclusion of each session there was a plenary discussion followed by an open discussion to allow participants to share any further points of concern or interest they felt had not been covered by the three questions. Filming the sessions allowed the Board to further reflect on what was said by participants. The media was invited to attend the community consultations with a view to making the sessions as open and transparent as possible. Summary notes of each session, drawing from the individual scribe notes, the plenary feedback notes, and the filmed footage of the plenary session, captured the key themes and issues raised during the respective discussions. The summary notes were uploaded onto the Inquiry website, and copies were also sent (by post or email) to each of the participants.

An important addition to the model previously used by the 2009 Victorian Bushfires Royal Commission was to compare community consultation registration data from the first seven sessions with Australian Bureau of Statistics demographic data published on the Latrobe City Council website. The purpose of this was to identify and address any gaps in community consultation.

In addition to the initial seven community consultation sessions, further sessions were arranged with Koori and Culturally and Linguistically Diverse communities, and local community service providers representing people with disabilities, young people, people in aged care and other groups within the community.

In the consultation session with the Koori community, an acknowledgement to Country was given and a yarning circle model was applied, where all participants sat together and worked through all three questions as a single group.

The community consultations enabled the Board to focus on providing answers to the questions community members were asking, relevant to its Terms of Reference.

Some of the key questions and issues for the community that emerged from the community consultations were:

- ownership of the Hazelwood mine
- the cause of the mine fire
- fire prevention measures adopted by the mine owner
- responsibility for monitoring the mine owner's compliance with regulations
- delivery and content of advice given by government authorities to the community, especially in relation to relocation
- safety standards for carbon monoxide and particulate matter in the air
- the decision not to evacuate the township of Morwell
- the application of financial and clean up assistance
- the health and environmental implications of the mine fire, now and into the future
- future prevention of similar disasters
- the long-term vision for Morwell and the Latrobe Valley.

The community consultations also helped Counsel identify community witnesses who could provide evidence in the formal hearings.

Professor John Catford of the Board, with the assistance of Gippsland Medicare Local, held a roundtable with Latrobe Valley General Practitioners on 7 May 2014.

PUBLIC SUBMISSIONS

Public submissions were one of the ways individuals and organisations were able to contribute to the Inquiry. Written submissions were submitted to the Inquiry from 31 March 2014 to 12 May 2014. Those who needed help to complete a submission were offered assistance by the Secretariat which made staff available to answer questions.

Over 160 submissions were received by the Board directly and a further 600 submissions were received through Environment Victoria's website. Voices of the Valley presented a health survey completed by 650 community members to the Board. Each member of the Board read and considered all written submissions.

INDEPENDENT EXPERTS

Taking into account the complexity of the issues to be assessed by the Inquiry, the Board engaged a number of independent experts:

- Professor David Cliff – Professor of Occupational Health and Safety in Mining and Director, Minerals Industry Safety and Health Centre, Sustainable Minerals Institute, The University of Queensland
- Mr Roderic Incoll AFSM – Bushfire Risk Consultant
- Professor Donald Campbell – Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health

- Ms Claire Richardson – Managing Director and Principal Consultant, Air Noise Environment Pty Ltd
- Professor James Macnamara – Professor of Public Communication, University of Technology, Sydney
- Mr Lachlan Drummond – Consultant, Research and Strategy Lead, Redhanded Communications.

The Board thanks these independent experts for sharing their expertise and for meeting tight timelines in the provision of reports.

PUBLIC HEARINGS

The Inquiry involved over three weeks of public hearings in Morwell from 26 May 2014. During that time the Board heard from the six independent experts and 13 community witnesses, and received 100 exhibits.

Counsel Assisting, Ms Melinda Richards SC and Mr Peter Rozen, led evidence and made final submissions to the Board.

Leave to appear before the Inquiry was granted to the State, GDF Suez and Latrobe City Council, and limited leave to appear was granted to Environment Victoria and the United Firefighters Union.

The Board heard evidence from a community witness on most days of the public hearings. The Board also heard evidence from GDF Suez personnel, including the Asset Manager (Chief Executive Officer) of the Hazelwood mine, senior government officials from a wide range of government departments and agencies, the Fire Services Commissioner (now the Emergency Management Commissioner), fire services personnel, the former Chief Executive Officer of the Environment Protection Authority, the Chief Health Officer, and the Acting Chief Executive Officer of Latrobe City Council.

The three weeks of public hearings were divided into themes. Evidence in the first week focused on the origin and circumstances of the fire, including how the fire started, why it became so fierce, the initial response of mine personnel and fire services, and what worked and did not work in suppressing the fire. A day of the hearings was devoted to evidence about firefighter health. The second week focused on evidence about environmental and health effects, relief and recovery, and communications. In the third week the Board heard evidence on measures to control risk and whether they were implemented, including rehabilitation of the worked out areas of the mine, and mine regulation. On the last day of hearings, the Board heard about new emergency management reforms to come into effect on 1 July 2014. Two days of oral submissions by each of Counsel Assisting, the State, GDF Suez, Environment Victoria and the United Firefighters Union, finalised the hearing.

OUTCOMES OF THE INQUIRY

Boards of Inquiry are not courts and the hearings are not court cases, although there are some similarities. Unlike a court case, there are no pleadings to limit and define the issues, and the rules of evidence are respected but are not binding. The Board and parties have a limited capacity to provide expert and other evidence or to test witnesses. The focus for an Inquiry is on lessons learned from past actions to improve future outcomes, rather than on establishing legal consequences.

The conclusions reached by the Board in this report are based on information available to the Board in the short time frame set for the Inquiry and for those responding to it.

RECOMMENDATIONS, AFFIRMATIONS AND FUTURE PROPOSALS

The Board has made 18 recommendations, taking into account issues raised by the Latrobe Valley community and the feasibility of implementation.

The Board has framed its recommendations broadly, so as not to constrain the best solutions by prescribing deadlines or particular details. A party's failure to take appropriate notice of the recommendations may result in adverse findings being drawn in the future.

The Board has also made affirmations where the State or GDF Suez has already taken action, or have announced a commitment to undertake action in response to the Hazelwood mine fire. This proactive approach has been a positive feature of the Inquiry.

The Board has included affirmations in the report for several reasons:

- where an action has been committed to, or is already underway, or has been funded, the Board considers that it did not have to make a separate recommendation
- to record agreed actions and to bring them to the community's attention
- to record agreed actions to enable monitoring of them on the same basis as monitoring of recommendations.

The Board has not been able, in the time available, to explore all reform options in depth, or test good ideas against a cost/benefit analysis. However, the Board considers that some proposals, that have arisen over the course of this Inquiry, warrant further attention.

IMPLEMENTATION MONITORING

The Bushfire Royal Commission Implementation Monitor, Mr Neil Comrie AO APM, has ensured that the 2009 Bushfires Royal Commission Report recommendations have come into effect. This success confirms the value of adopting a process so that government and the community have access to transparent independent verified information about the implementation of commitments and responses to the Board's recommendations. Monitoring arrangements reduce the prospect that this report will simply sit on a shelf.

RECOMMENDATION 1

The State empower and require the Auditor-General or another appropriate agency to:

- oversee the implementation of these recommendations and the commitments made by the State and GDF Suez during this Inquiry; and
- report publicly every year for the next three years on the progress made in implementing recommendations and commitments.

CONDUCT OF BOARDS OF INQUIRY

The Board of Inquiry wishes to make some observations about its powers to conduct the Inquiry.

The Board was appointed pursuant to s. 88C of the *Constitution Act 1975* (Vic). Its powers are set out in the Order in Council dated 21 March 2014, and in Part 1, Division 5 of the *Evidence (Miscellaneous Provisions) Act 1958* (Vic) (Evidence Act). The Board could summon any person to give evidence or produce documents to the Board, and could take evidence on oath. Pursuant to s. 21A of the Evidence Act, the Board, the legal practitioners appearing with leave before the Board, and witnesses, are entitled to the same privileges and immunities as if the Inquiry were an action in the Supreme Court of Victoria.

In the course of conducting the Inquiry, the Board became conscious of a number of limits on its powers to obtain evidence and regulate its own procedure.

First, the Board had no power to prohibit publication of evidence received by it during its public hearings. While the Evidence Act was amended in 2010 to enable a Royal Commission to make such an order, the Board had no power to restrict publication of its proceedings.[2] This limits the ability of a Board of Inquiry to receive sensitive evidence, for example evidence that has security implications, is commercially sensitive, or deals with matters of an intensely personal nature.

Second, a Board of Inquiry does not have the capacity to deal with contempt of its processes. The chairperson of a board can report a refusal to attend in response to a summons or to refuse to answer a question to the Attorney-General, who may then apply to the Supreme Court of Victoria for an order dealing with the person concerned.[3] It would enhance the independence of Boards of Inquiry if they were not dependent on a Minister of the Crown to enforce their processes.

Third, while fairness obliged the Board to give the parties access to witness statements and other documents to be tendered in evidence during its public hearings, the Board had no power to ensure that the parties used that evidence only for the purposes of the Inquiry.[4] This is another aspect of the inability of a Board of Inquiry to deal with contempt of its processes.

Finally, there is no protection from adverse consequences available to persons who provide information or give evidence to an Inquiry. An Inquiry is not able to receive protected disclosures under the *Protected Disclosure Act 2012* (Vic). In the course of the Inquiry, staff of the Board were approached by people who had relevant information to provide, but who were not prepared to give evidence in a public hearing for fear of reprisals, for example in their employment or in their commercial dealings. 'Firefighter L' was one example. There were a number of others. This was a significant limitation on the Board's ability to inquire into the matters set out in its Terms of Reference.

The Board notes that the 2009 Victorian Bushfires Royal Commission and before it, the Royal Commission into the Metropolitan Ambulance Service, recommended the development of specific legislation for the conduct of inquiries in Victoria (Teague, McLeod & Pascoe, 2010, Vol III, p. 54; Lasry, 2001). These recommendations have not yet been implemented, despite the valuable groundwork laid by the Australian Law Reform Commission in its 2010 report 'Making Inquiries: a New Statutory Framework'. The Board joins these Royal Commissions in urging the Victorian Government to develop and implement legislation for the conduct of Commissions and Boards of Inquiry in Victoria.

On the eve of publication of this report, the State Government introduced the Inquiries Bill 2014 (Vic) into the Victorian Parliament.

THE HAZELWOOD MINE FIRE INQUIRY REPORT

This report is the culmination of the Board's work and reflects the entire conduct of the Inquiry.

Chapters in Part Two The fire include information about the origin and circumstances of the Hazelwood mine fire, measures taken by the State and GDF Suez to prepare to respond to fire, and the effectiveness and execution of those measures during the Hazelwood mine fire.

This section speaks primarily to fire services agencies and GDF Suez, but will also be of interest to members of the community who want to know how the fire started and why it took so long to extinguish.

Chapters in Part Three Fire risk management discuss the adequacy and effectiveness of measures taken to prevent and mitigate the spread of fire at state, regional and municipal levels, as well as at the Hazelwood mine itself. These chapters also consider whether GDF Suez implemented recommendations arising from reviews of previous fires and complied with legal obligations under the mine licensing and occupational health and safety regimes.

Chapter 3.1 is directed to the State and the Latrobe City Council, while Chapter 3.2 discusses the performance of the Victorian WorkCover Authority and the Mining Regulator. Chapter 3.3 focuses on the actions of GDF Suez, but also addresses issues raised by community members and environmental groups, such as rehabilitation of the Hazelwood mine.

Chapters in Part Four Health and wellbeing respond to concerns surrounding the environmental and health effects of the fire, and the adequacy and effectiveness of the health, relief and recovery response by government agencies.

Part Five Communications includes an analysis of how government agencies and GDF Suez managed their public communications and the overall effectiveness of crisis communication methods employed during the Hazelwood mine fire.

The Health and wellbeing and the Communications parts will be of most interest to the community and agencies responsible for health, environment, relief, recovery and communications.

The Board has structured the report in this way for a number of reasons.

The Board's guiding motivation was to ensure that each section served as a single reference point for the key stakeholders most interested in the subject matter of that section, and the parties responsible for implementation of the corresponding recommendations made by the Board.

Individual chapters have also been structured around the Board's Terms of Reference. It quickly became apparent to the Board that certain elements of its Terms of Reference and the evidence relevant to them overlap in a number of respects. For example, it is difficult to assess the adequacy and effectiveness of fire preparedness measures taken by the State and GDF Suez without a detailed understanding of the difficulties encountered during the firefighting response. Similarly, it is difficult to report on the adequacy and effectiveness of the administration and enforcement of mine licensing and occupational health and safety regimes without a discussion of the underlying regulatory framework and the measures adopted by GDF Suez under this framework.

Other Terms of Reference call for an examination of a range of actions by different parties. For example, there are a number of dimensions to regulation of the risk of, and response to, the Hazelwood mine fire, with different areas directed to different stakeholders. While a degree of duplication is unavoidable, the Board has strived to avoid this wherever possible.

BACKGROUND

THE LATROBE VALLEY AND MORWELL

A brief background of the Latrobe Valley, Morwell and the Hazelwood mine is outlined below to provide the reader with a broader context for the event that is the subject of this Inquiry.

The Latrobe Valley is home to over 70,000 people and is one of four regional cities in Victoria.

The Latrobe Valley has a long history of Indigenous settlement. Due to both the picturesque and productive nature of the land, European exploration and settlement began from the 1830s onwards, mainly for farming and agricultural purposes. Farming and agriculture is still very much a part of the Latrobe Valley today. Since the late nineteenth century the significant brown coal reserves located in the Latrobe Valley have been mined.

The Latrobe Valley coal reserves are unique and are characterised by a relatively thin layer of soil and clay (called 'overburden') covering massive coal seams that are on average 100 metres thick. This makes accessing the vast brown coal reserves in the Latrobe Valley relatively easy compared with elsewhere in the world, where there is the opposite ratio of coal to overburden.[5]

The 1920s saw an influx of migrants settling in the Latrobe Valley, many of whom had fought in World War I and came to the region to take up work in the Old Brown Coal Mine (Latrobe City Council, 2010, p. 7). Prior to World War II, Morwell and other towns in the Latrobe Valley remained predominantly agricultural in nature, with Morwell first established as a railway town as far back as the mid-nineteenth century.

The town of Morwell and its history are closely linked to coal mining. This is obvious today by the physical proximity of the town to the Hazelwood mine and power station. It is important to recognise that although coal mining has played a large role in the history of the Valley, it does not define the town or the people of Morwell. Rather, the development and expansion of coal mining in the area over time has had a direct impact on the people of Morwell due to the town overlaying a significant coal deposit. In the context of the Hazelwood mine and power station being built to the south of Morwell, the town has expanded to the east and to the north. Despite such expansion away from the mine, the southern perimeter of Morwell is still remarkably close to the mine site.

In more recent times, mining in the Latrobe Valley has increased, transforming the landscape from mostly agricultural to industrial. There are now three open cut coal mines in the Latrobe Valley: Yallourn, Loy Yang and Hazelwood. Today the Hazelwood Mine provides approximately 25 per cent of Victoria's baseline electricity supply (Vines, 2008, p. 26).[6] This has created a dramatic contrast in the current landscape, with industrial areas meeting open green plains, as well as townships and people.

The Latrobe Valley community is less prosperous and less healthy overall than the rest of Victoria, even though it contributes significantly to Victoria's economic wealth. Median household incomes are significantly lower than the Victorian average, and there is a much higher proportion of low income households in the Latrobe Valley than in Victoria at large.

Morwell has an ageing population and the percentage of people living there who need assistance due to a disability is twice the rate for the rest of Victoria. Health outcomes are markedly worse in the Latrobe Valley. The community of the Latrobe Valley has been particularly hard hit by asbestos related disease. There would be few long-term residents who do not know someone who has suffered or died from a lung disease caused by inhalation, decades earlier, of asbestos dust.[7]

The Latrobe Valley is also a proud, strong and resilient community. Morwell has had a strong sense of community throughout its history. In the very early stages of the town's establishment, places central to the community's life and activity, such as schools, churches and a town hall, were built. These amenities are symbolic of the emphasis the community placed (and continues to place) on people and families.

The Latrobe Valley and Morwell have a vibrant well-established community network and a large cohort of volunteers. These aspects of the community were on display this year during the mine fire. They continue to be on display as the community, local business and local government work to clean up and recover from the fire's effects.

The Latrobe Valley, like much of Victoria and many parts of Australia, has been greatly affected by bushfire. The town of Morwell suffered damaging fires in 1890 and then again in 1912, prompting the creation of the first reticulated supply of water for the town in 1913 (Latrobe City Council, 2010, p. 15). There are fires in the area every summer. Sometimes these fires are catastrophic. Five years ago, on Black Saturday, the Churchill fire claimed 11 lives, injured 35 others and destroyed 145 houses. At one stage the fire threatened the Loy Yang open cut coal mine. On the same day, fires were also burning at Delburn and Bunyip, not far away (Teague, McLeod & Pascoe, 2010, Vol 1, pp. 39-68 & 127-142).

It is not uncommon for there to be multiple significant fires burning in the region at the same time. This was certainly the case on 9 February 2014 when the entire State was facing the most extreme weather conditions of that bushfire season and the worst conditions since Black Saturday (which occurred almost five years to the day on 7 February 2009).

THE HAZELWOOD MINE

Coal deposits at Morwell were discovered in the late nineteenth century by the Great Morwell Coal Mining Company, which was established in October 1888 (Vines, 2008, p. 26). The Hazelwood mine site was transferred to the State Electricity Commission of Victoria (SECV) on 1 April 1924 (Vines, 2008, p. 48).

Demand for electricity post World War II meant that the SECV had to expand and increase its operations beyond the Yallourn mine. In 1949, the SECV established the Hazelwood mine, then known as the Morwell Open Cut, in order to supply brown coal to the adjoining briquette works, now part of the Energy Brix Power Station. Mining operations initially commenced in 1955 in what is now known as the east field, bounded at the north by the northern batters.[8]

The Hazelwood mine was further developed from the late 1950s. Between 1964 and 1971, the Hazelwood Power Station was built and demand for coal from the Hazelwood mine increased dramatically (Latrobe City Council, 2010, p. 30). The Hazelwood pondage was constructed in the early 1970s to establish a supply of cooling water for the Hazelwood Power Station (Latrobe City Council, 2010, p. 16). Mining of the east field continued until about 1980.[9] The Hazelwood mine then expanded to the south-west, then to the south-east and then west again, where the operational area of the mine is now situated.[10] Under the current proposed mining schedule, mining at the Hazelwood mine will continue to the west and then to the north before the anticipated closure of the mine in 2031.[11]

In the early to mid-1990s, the Victorian Government privatised the SECV, and its power stations were sold separately to overseas interests. The privatisation of the Hazelwood mine was part of this process.

The Hazelwood mine, including the land on which it operates, is owned by the Hazelwood Power Partnership. Since 7 June 2013, the four partners have been subsidiaries of International Power (Australia) Holdings Pty Ltd. This company is in turn jointly owned by subsidiaries of GDF Suez S.A. (72 per cent ownership) and Mitsui & Co Ltd (28 per cent ownership). GDF Suez S.A. is a global energy company with corporate headquarters in France. Mitsui & Co Ltd is a global trading company with corporate headquarters in Japan.[12]

The Hazelwood Power Corporation Ltd holds mining licence MIN 5004 and operates the mine. Personnel working at the mine are employed by Hazelwood Power Corporation Ltd. This corporation is also owned by the Hazelwood Power Partnership and thus jointly through subsidiaries by GDF Suez S.A. and Mitsui & Co Ltd.[13] In this report, 'GDF Suez' refers to the mine owner, operator and licensee of the Hazelwood mine and includes the Hazelwood Power Partnership.

February 2014 is not the first time a fire has occurred in a mine in the Latrobe Valley, nor the first time a fire has occurred at the Hazelwood mine. The first known fire in an open cut mine in the Latrobe Valley was in 1896. Further open cut mine fires occurred at the Hazelwood site, most notably in 1977, 2006 and 2008. The mine fire of 1944 at Yallourn which resulted in the Stretton Royal Commission is also well known. Other fires at the Hazelwood mine are discussed in further chapters of this report.

1. Teague T4:21 – T5:8
2. *Crimes Legislation Amendment Act 2010* (Vic), s. 7
3. A 'law officer' in s. 20 of the *Evidence (Miscellaneous Provisions) Act 1958* (Vic) is defined in s. 38 of the *Interpretation of Legislation Act 1984* (Vic) to be the Attorney-General or any Minister of the Crown acting for or on behalf of the Attorney-General
4. By contrast, there is an implied obligation not to use documents obtained by discovery or other compulsory court process for a purpose other than use in proceedings: *Hearne v Street* (2008) 235 CLR 125 and *Harman v Home Department State Secretary* [1983] 1 AC 280
5. Exhibit 60 – Statement of Robert Gaulton, para. 13; Exhibit 88 – Statement of James Faithful, para. 28; Gaulton T1695:31 – T1696:6
6. Written submission of GDF Suez, 18 June 2014, para. 61
7. Details about the Health of the Latrobe Valley community can be found in Part Four Health and Wellbeing
8. Exhibit 90 - Statement of Richard Polmear, paras 6, 7 & 9
9. Exhibit 90 - Statement of Richard Polmear, para. 11
10. Polmear T2039:5-25
11. Exhibit 59 – Statement of Kylie White, annexure KAW-12, pp. 4-3 & 5-2
12. Mitsui, Mitsui & Co Corporate Profile, viewed 16 July 2014, http://www.mitsui.com/jp/en/company/outline/
13. Exhibit 66 – Letter from King & Wood Mallesons dated 2 May 2014

Image source *Fairfax Syndication*

Image source *Keith Pakenham, CFA Pix*

PART TWO
THE FIRE

2.1 Origin and circumstances of the Hazelwood mine fire
2.2 Preparing for fire
2.3 Fighting the Hazelwood mine fire

2.1 ORIGIN AND CIRCUMSTANCES OF THE HAZELWOOD MINE FIRE

OVERVIEW

Under its Terms of Reference, the Board of Inquiry must report on the origin and circumstances of the Hazelwood mine fire, including how it spread into the mine.

The Hazelwood mine fire started as a series of smaller fires that ignited in the northern, eastern and south-eastern batters of the mine on 9 February 2014. For the purposes of this report, the Board refers to all fires within the mine as the 'Hazelwood mine fire' or 'mine fire'.

In order to ascertain the origin and circumstances of the mine fire, the Board has considered Victoria's particular vulnerability to fire, the fire activity in the vicinity of the mine in the days leading up to the mine fire, and witness observations at the time the mine fire ignited and spread.

Victoria is one of the most fire prone areas in the world. Victoria is at risk of bushfire every summer. Leading up to and during 9 February 2014, Victorians were given explicit warning that they were to prepare for potentially catastrophic fire conditions.

On 7 February 2014, the Hernes Oak–McDonald's Track fire started approximately five kilometres to the north-west of Morwell. At approximately 1.15 pm on 9 February 2014, the fire broke containment lines and became known as the Hernes Oak fire. At approximately 1.40 pm on 9 February 2014, several fires ignited near Driffield. Those fires quickly joined to form one fire front. This fire is referred to as the Driffield fire.

The Hernes Oak and Driffield fires were burning in close proximity to the Hazelwood mine. Embers were first seen spotting into the mine just prior to 2 pm on 9 February 2014. At around 2 pm, GDF Suez mine personnel observed the first fire in the Hazelwood mine. The fire quickly spread and was well established in the Hazelwood mine by early evening on 9 February 2014.

The Board accepts the evidence of GDF Suez personnel who saw embers in the air over the mine in the afternoon of 9 February 2014. The Board also accepts the evidence of the Fire Services Commissioner regarding embers spotting into the mine. This evidence was supported by Mr Jaymie Norris, Acting Manager of the Strategic Bushfire Risk Assessment Unit at the Department of Environment and Primary Industries. Mr Norris produced a simulation of the likely fire behaviour on 9 February 2014 based on the conditions of that day. Independent expert Mr Roderic Incoll, Bushfire Risk Consultant, further supports the evidence of GDF Suez personnel and Mr Norris about the likely fire behaviour on the day, having regard to the weather conditions.

The Board concludes that spotting from other fires was the most likely cause of the Hazelwood mine fire. Based on the information before it, the Board concludes that the fire did not start within the mine, either from a hot spot or from the operating area.

It is difficult to determine with precision which of the one or more external fires was responsible for the spotting of embers into the Hazelwood mine. On the evidence provided, the Board concludes that spotting from the Hernes Oak fire was the more likely cause of the Hazelwood mine fire, while spotting from the Driffield fire may have also contributed.

Victoria Police consider the cause of both the Hernes Oak-McDonald's Track fire and Driffield fire to be suspicious and are investigating both fires.

The Board's Terms of Reference expressly provide that the Inquiry not prejudice any investigation into the fire by Victoria Police, and that the Board work cooperatively with other investigations to avoid unnecessary duplication. Based on the evidence of Detective Inspector Michael Roberts, Victoria Police, the Board accepts that investigation of the causes of the Hernes Oak-McDonald's Track and Driffield fires is properly the province of Victoria Police.

THE THREAT OF FIRE IN VICTORIA

> Sunday (9 February 2014) will be the worst fire conditions that Victoria has experienced since 2009. It's a very serious position that we are in and it is all due to the fact that we've had extended heat periods. The heat will extend all through Saturday night into Sunday and Sunday actually deteriorates with extreme fire danger rating in six districts.
>
> Those six districts are right through Central Victoria, North Eastern and Gippsland but all Victorians should understand that tomorrow anywhere in Victoria, fires will run, and run hard.
>
> Fire intensity: they will be furious, they will be fast, they will be out of control and people need to be very aware of that.
>
> Don't start a fire. We need people to understand that we do not need fires anywhere in Victoria and we certainly don't need people that in foolish steps are the cause of the fire.
>
> We also remind everyone to have a plan. It is time to refresh your plan. Make sure that the plan suits your needs. Where ever you are in Victoria, if you are home, if you are travelling, make sure that you've got a plan. If you intend to leave, leave early. If you intend to leave know where you are going. Take what you need to take with you. But certainly consider the fact of leaving early. Extreme fire danger rating means fires will be intense and very fast moving.
>
> Today we have already experienced that. We've got fires in Gippsland. There is one in Latrobe Valley, near, between Moe and Morwell. Started last night. The Princes Highway was closed, reopened and is now closed again. Due to the fact that the fire is now active again. That tells us that getting control of these fires is very difficult and will be challenging in any part of Victoria.[1]

This warning from Mr Craig Lapsley, Fire Services Commissioner, on 8 February 2014 and repeated throughout the weekend, could not have been clearer. Victorians were to prepare for potentially catastrophic fire conditions on 9 February 2014.

Mr Lapsley delivered this warning in the context of Victoria's vulnerability to fire, past experience with bushfires, and the predicted weather forecast.

VICTORIA'S VULNERABILITY TO FIRE

Since the 1950s, Australia has experienced an increase in the duration, frequency and intensity of heatwaves. Since the 1970s, there has been a noticeable increase in extreme fire weather and lengthened fire seasons across Australia, particularly in the south-east of the country. The risk of bushfire will continue to increase, with more and more extremely hot days and intense heatwaves predicted.[2]

Every fire season, Victoria experiences bushfires. Many of these bushfires are catastrophic fire events resulting in the loss of life and property. Between February 1851 and February 2007, there were 52 major fire events in Victoria resulting in 372 deaths, extensive property, flora and fauna loss, and the burning of millions of hectares of land (Teague, McLeod & Pascoe, 2010). On 7 February 2009, the bushfires of Black Saturday resulted in the death of 173 Victorians. Many of these fires (including the Black Saturday fires) have impacted the Gippsland area.

Extreme fire danger weather in Victoria routinely occurs in February. Extreme fire danger weather is characterised by a strong to gale force north-westerly wind, frequently followed by a strong south-westerly wind change. The most turbulent fire behaviour almost invariably occurs before and after the wind change. A fire igniting under the influence of a north-westerly wind rapidly extends a narrow wind-driven front to the south-east before the wind change causes the eastern flank of the fire to whip around to the north-east, creating a wider fire front.[3] This weather pattern and its effect on fire behaviour is illustrated in Figure 2.1.

Figure 2.1 Effects of weather on the fire front

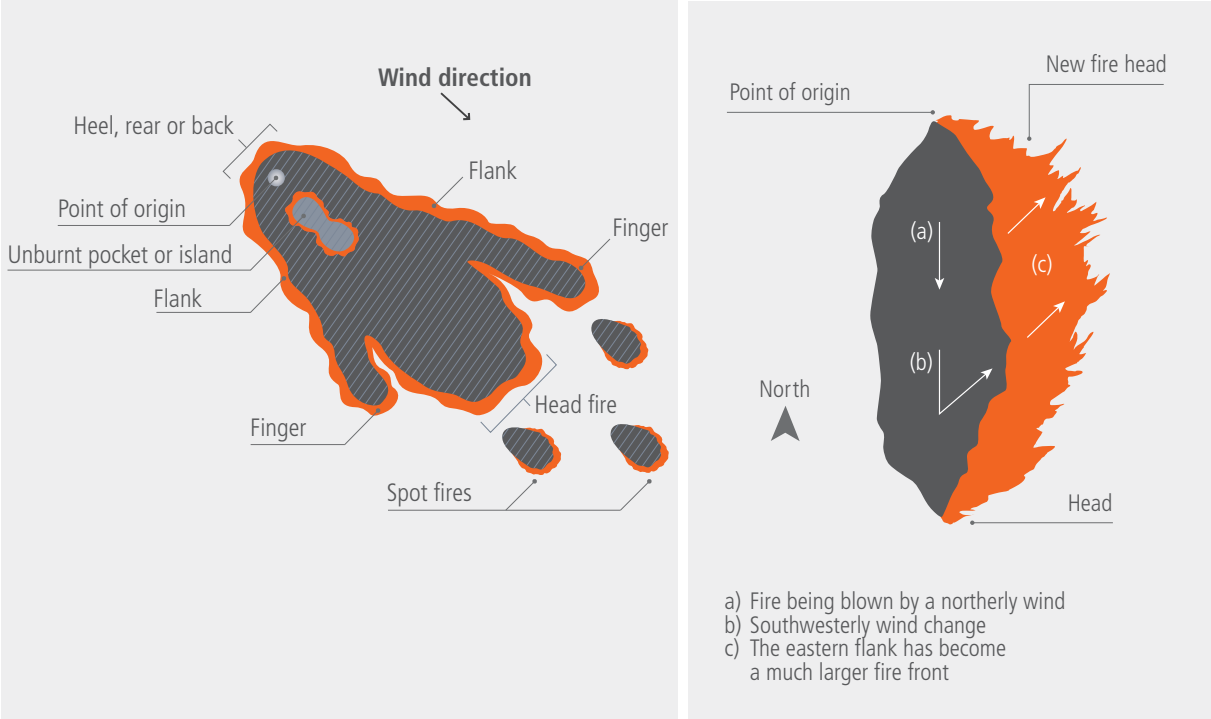


Image Source *2009 Victorian Bushfires Royal Comission Final Report*

Embers from the fire front follow the course of the strong, blustery winds associated with the wind change, and are further exacerbated by dry fuel sources. Ember throw or spotting is characteristic of fast running and destructive fires.[4] Additional fire, or fire spread, caused by ember spotting is 'a well-demonstrated and well-known propensity of fires and has been for many years.'[5]

Tree bark is responsible for most spotting or ember throw ahead of a bushfire. Many of Australia's Eucalypt species shed their bark annually, resulting in the accumulation of bark ribbons, providing an ignition source in a high intensity fire. These bark ribbons can stay alight in excess of 30 minutes. They can travel up to five kilometres in strong winds, and 20–30 kilometres if caught up in convection columns.[6]

Victoria is undeniably one of the most bushfire prone areas in the world. Despite the high risk of a catastrophic fire event occurring, many Victorians continue to underestimate the probability of fire events and 'hope for the best' in the fire season. This approach ultimately impedes their ability to prepare for, and to respond to, the reality of fire.

REDUCING COMPLACENCY

Warnings such as those issued by Mr Lapsley on 8 February 2014 are made in an attempt to reduce complacency about the risk of bushfires.

The risk of bushfire is not isolated to regional forested areas of Victoria. Areas of suburban Melbourne are susceptible, although less so than country towns. Grass fires pose a significant threat, especially to farming regions. Experience has demonstrated that the most vulnerable fire areas are near forests, elevated land and open cut mines.

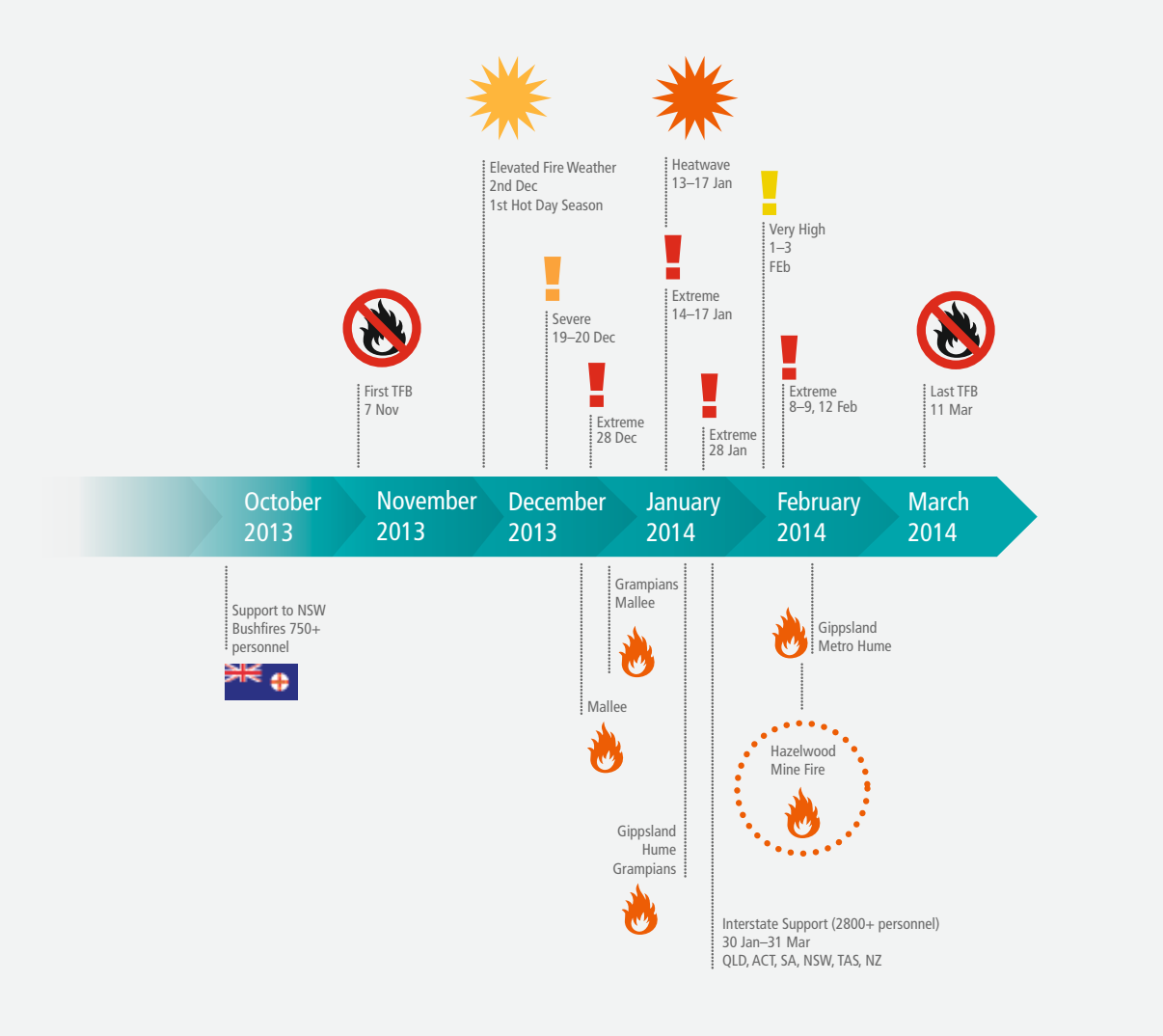
The particular vulnerability of open cut coal mines to fire is evident not just in Australia but all over the world. Brown coal mined in Victoria has a number of features which differentiate it from black coal. Both black and brown coal are highly combustible. However, brown coal is more porous. This can make fire in a brown coal mine more difficult to extinguish. Fire in brown coal can easily get within the coal and smoulder beneath the surface because of jointing (partings due to geological forces). This phenomenon is not replicated in black coal. Additionally, Victorian brown coal is unique in the sense that there is only a thin layer of overburden sitting above very deep coal seams. It is for these reasons that Victorian open cut coal mines are so vulnerable to fire.[7]

2013/2014 SUMMER FIRE CONDITIONS

As is typical of Victorian summers, 2014 was marked by hot and dry weather conditions. By the middle of January much of the grassland and forest areas across Victoria had dried out, presenting a significant fire hazard. Under northerly winds, these conditions created the potential for high rates of fire spread.[8]

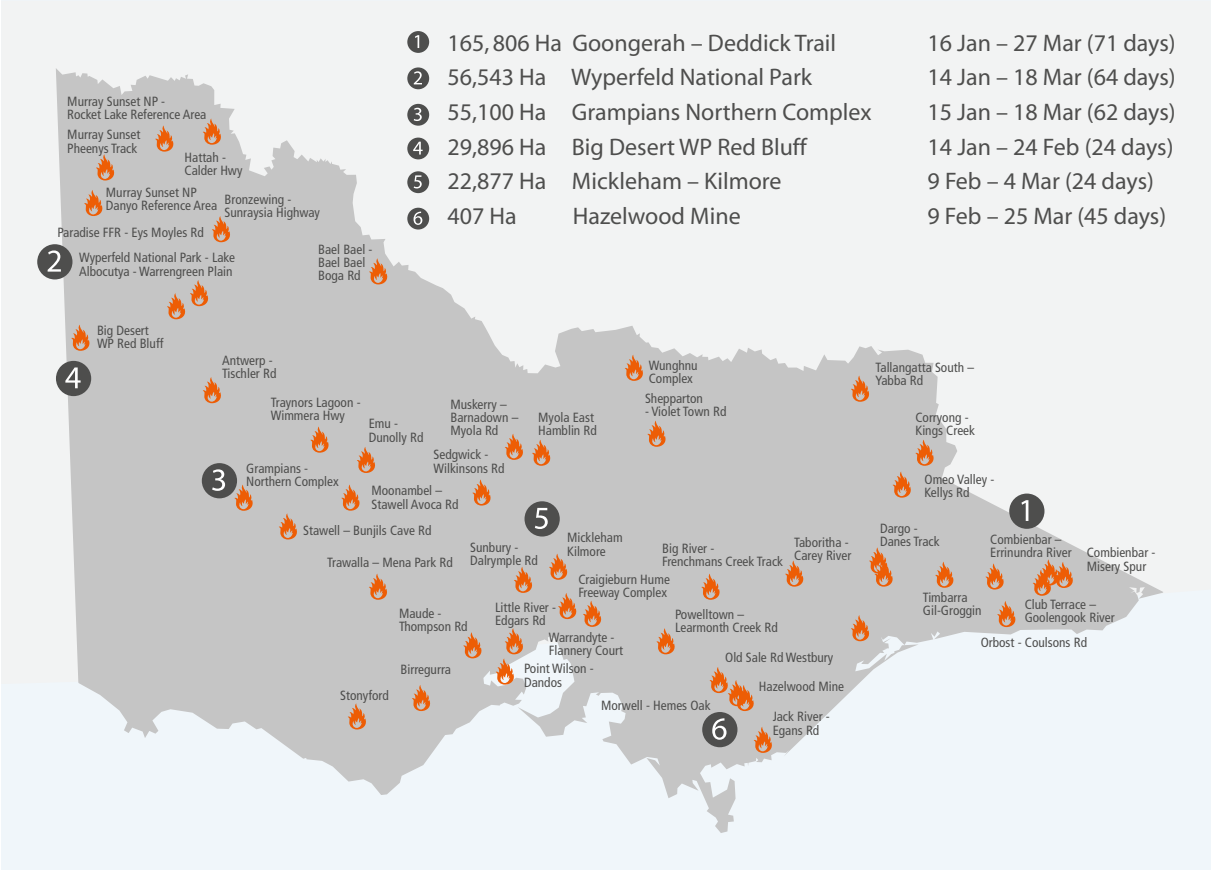
An extreme heatwave affected Victoria from 13–17 January 2014, breaking numerous records for extended periods of heat, including the hottest four-day period on record for both maximum and daily mean temperature.[9] This behaviour is illustrated in Figure 2.2.

Figure 2.2 Overview of the 2013–2014 fire conditions[10]



By the middle of January 2014, several major fires were burning across Victoria. These included a 55,100 hectare fire in the northern Grampians region, and the Goongerah–Deddick Trail fire in East Gippsland, which ignited on 16 January 2014 and ultimately burned for 71 days across 165,806 hectares.[11] An overview of the fires in Victoria in January to March 2014 is contained in Figure 2.3.

Figure 2.3 Overview of fires in Victoria January – March 2014[12]



WORST FIRE CONDITIONS EXPECTED SINCE BLACK SATURDAY 2009

The weather conditions forecast for the weekend of 8 and 9 February 2014 were the most dangerous fire conditions since the Black Saturday fires in 2009. The Latrobe Valley Airport weather station had recorded 16 days above 30 degrees and only 28.2 millimetres of total rainfall for 2014 prior to 9 February.[13]

Prior to and during the weekend of 8 and 9 February 2014, the Fire Services Commissioner and the Chief Health Officer made several announcements warning the community about the potential for extreme weather conditions and associated fire and health risks.[14]

By the evening of 7 February 2014, 16 fires were listed as 'going' across Victoria. By 4 pm on 8 February 2014, there were 25 fires listed as 'going' across the State, and 9 February 2014 was forecast to be a critical fire weather day following hot overnight conditions. The State was managing these fire events from the State Control Centre and all firefighting resources not already committed to existing fires were at maximum levels of readiness.[15]

THE COMPLEXITY OF THE HAZELWOOD MINE FIRE

The complex of fires that began on 9 February 2014, known as the Hazelwood mine fire, was the latest in a series of mine fires in the Latrobe Valley and is by far the biggest and longest. The fire was long-lasting and impacted significantly on the Latrobe Valley community. The mine fire had minimal impact on the ability of the power station to continue to generate and supply power to the national electricity grid.

In considering the circumstances surrounding the Hazelwood mine fire, the Board has reviewed whether the fire in the mine originated from an external source to the mine or from a source within the mine's perimeter.

There were three major fires that were in the immediate surrounds of the Hazelwood mine on and leading up to 9 February 2014, when the mine fire took hold. Those fires were named as the:

- Hernes Oak–McDonald's Track fire, which ignited on 7 February 2014
- Hernes Oak fire, which broke out from the Hernes Oak–McDonald's Track fire on 9 February 2014
- Driffield–Strzelecki Highway fire which ignited on 9 February 2014.

Each of these fires and their impact on the Hazelwood mine is discussed in turn.

THE HERNES OAK–MCDONALD'S TRACK FIRE

The Hernes Oak–McDonald's Track fire ignited on 7 February 2014. The Country Fire Authority (CFA) Fire Investigation Report records that the fire was reported to CFA via a 000 call at 3.18 pm. The origin of the fire was recorded as the intersection of McDonald's Track and McGraths Track, Hernes Oak, which is approximately five kilometres west of Morwell.[16]

The Hernes Oak–McDonald's Track fire was initially a fast moving grass fire. It covered an area of approximately 150 hectares by 8 pm that night. The fire was reported as 'going' and was being managed as a Level 1 fire incident by the local CFA.[17]

By 8 am on 8 February 2014, the fire was contained and by 9.30 am, a control line had been established around the fire.[18] The fire was still burning internally.[19] As at 11 pm on 8 February 2014, the Hernes Oak–McDonald's Track fire had covered 156 hectares and its perimeter had been fully tracked for patrol by firefighters.[20]

The Hernes Oak–McDonald's Track fire remained contained throughout the morning of 9 February 2014.[21] The small plume of smoke from the Hernes Oak-McDonald's Track fire can be seen in Figure 2.4 below.

Figure 2.4 Hernes Oak–McDonald's Track fire at 9.25 am on 9 February 2014[22]

This photograph shows the footprint of the Hernes Oak–McDonald's Track fire as at 9.25 am on 9 February 2014, taken facing east. Smoke from the fire can be seen in the lower right-hand side of the photograph. The Yallourn mine can be seen at the top of the photograph with the Princes Freeway curving from the middle left-hand side of the photograph to the top middle of the photograph.

THE HERNES OAK FIRE

At approximately 1.15 pm on 9 February 2014, the Hernes Oak–McDonald's Track fire was reported as having escaped its containment lines. The bigger fire that ensued after the Hernes Oak–McDonald's Track fire escaped is known as the Hernes Oak fire.[23]

The CFA Fire Investigation Report records that the Hernes Oak fire broke its containment lines in the north-east area of the fire footprint. From there the fire ran parallel on the north and south sides of the Princes Freeway in a south-easterly direction towards Morwell and the Hazelwood mine[24] under the influence of a generally north-westerly wind.

The Board was provided with photographs taken from the air, which identify the spread of the Hernes–Oak fire and the effect of the wind change during the course of the morning and early afternoon of 9 February 2014 (see Figures 2.5 and 2.6).

Figure 2.5 The Hernes Oak fire travelling on a generally north-westerly wind on 9 February 2014[25]

This photograph was taken facing east from an aircraft hovering above the Princes Freeway at 1.27 pm on 9 February 2014. The Morwell township is in view in the top left-hand corner and the Hazelwood mine is in the top-middle of the photograph.

Shortly before 2 pm, from a vantage point near the north-western boundary of the mine, GDF Suez personnel observed the flames from the Hernes Oak fire spreading in the general direction of the Hazelwood mine and saw embers inside the mine's perimeter.[26]

Prior to the fire reaching the mine's north-western perimeter, the wind changed from a more north-westerly wind to a more south-westerly wind.[27] The Bureau of Meteorology provided an analysis to the Board of the wind change by reference to the location of Morwell and the timing of the wind change recorded at the Latrobe Valley Airport automatic weather station, situated seven kilometres north-east of Morwell. The Bureau estimated that the likely time of the wind change at Morwell was 1.40 pm, to within plus or minus five minutes.[28] The effect of the wind change can be seen in Figure 2.6.

Independent expert, Mr Roderic Incoll, Bushfire Risk Consultant, also provided evidence to the Board about the prevailing winds on 9 February 2014. Appendix 3 to Mr Incoll's report describes changes throughout the day to the wind speeds and gusts, and temperatures (amongst other weather features), from information at the Latrobe Automatic Weather Station based at the Latrobe Airport. Between 12.30 pm and 1.56 pm, the wind directions are shown as:

- 1.30 pm: north-westerly wind with wind gusts of 57 kilometres an hour
- 1.47 pm: west-south-westerly wind with wind gusts of 63 kilometres an hour
- 1.52 pm: south-south-westerly wind with wind gusts of 63 kilometres an hour
- 1.56 pm: south-westerly wind with wind gusts of 74 kilometres an hour.[29]

Appendix 3 to Mr Incoll's report also describes the drop in temperature from 40 degrees at 1.30 pm to 28.2 degrees at 1.56 pm after the wind had changed direction.[30]

Figure 2.6 The Hernes Oak fire moving generally north-easterly with the wind change on 9 February 2014[31]

This photograph was taken from an aircraft facing north-west at 1.41 pm on 9 February 2014. The Morwell township is not visible because it is covered by smoke. The Hazelwood mine is not in the photograph but is located to the right of the photo edge.[32]

At approximately 2.10 pm on 9 February 2014, Mr David Shanahan, GDF Suez Services Superintendent, observed the Hernes Oak fire near the northern boundary of the Hazelwood mine. He took two photographs showing fire in the plantations to the immediate north of the mine boundary, neighbouring the Strzelecki Highway. (as shown in Figure 2.7).[33]

Figure 2.7 The Hernes Oak fire near the Strzelecki Highway on 9 February 2014[34]

These two photographs were taken at 2.10 pm (left) and 2.17 pm (right) by Mr Shanahan. Both photographs show fire in the plantations to the immediate north of the mine boundary, neighbouring the Strzelecki Highway.[35]

As a consequence of the wind change, the general direction of the fire changed. It started burning in a generally north-easterly direction towards and into the western edge of the Morwell residential area.[36] The Hernes Oak fire spotted into the Yallourn mine[37] and the west of Latrobe Street, and then burned into the plantations north of Morwell.[38]

The cause of the Hernes Oak–McDonald's Track fire was investigated by the CFA. Although a CFA investigator concluded that the fire was caused by the inadequate control of a camp fire,[39] Victoria Police regard the fire as suspicious and it is the subject of an ongoing police investigation.[40] Victoria Police have excluded lightning strike and power asset failure as causes of the Hernes Oak–McDonald's Track fire.[41] There is no suggestion in the evidence before the Board that the break out of the Hernes Oak fire was itself suspicious, although this is also under police investigation.

THE DRIFFIELD FIRE

The Driffield fire appears to have started as more than one fire. At approximately 1.37 pm, reports were made of several fires south-west of Morwell along the Strzelecki Highway at Driffield.[42] GDF Suez mine personnel observed three areas of smoke south of the Hazelwood mine at around 2 pm.[43]

These fires quickly merged and moved in a north-easterly direction toward the mine.[44] Bureau of Meteorology records show that at about the time when the Driffield fire was reported, the wind change had taken place and was a strong south-westerly wind.[45] The Driffield fire burnt up to the Morwell River diversion, which runs along the mine's western and southern boundaries. It did not cross directly into the mine.[46] The Driffield fire was contained at the Morwell River diversion by early evening.[47]

The cause of the Driffield fire is also the subject of a Victoria Police investigation.[48] Victoria Police consider that the fire may have been the result of arson.[49] Detective Inspector Michael Roberts, Officer in Charge of the Arson and Explosives Squad, confirmed that police have excluded lightning strike, power lines and other electricity assets as possible causes of the Driffield fire.[50]

THE HAZELWOOD MINE FIRE

HAZELWOOD MINE

To understand the impact of the fire in the Hazelwood mine, it is first necessary to understand the mine itself and its geography.

The main entrance to the Hazelwood mine and Power Station is located on Brodribb Road, south of Morwell. The mine is bordered by the Princes Freeway (to its north), the Strzelecki Highway (to its north and west), the Morwell River diversion (to its west), and the Hazelwood pondage (to its south). The mine licence area currently covers approximately 3,138 hectares, with the open cut covering an area of about 1,165 hectares. The perimeter of the open cut is over 18 kilometres in length.[51]

The worked out areas of the mine include parts of the mine called the northern, eastern and south-eastern batters. The operating area of the mine is on the current western batters. A batter is the individual near-vertical coal face on a 45 degree angle from the floor of the mine.[52] The batters are labelled 1 level, 3 level, 5 level and 7 level, with 1 level being grass level at to the top of the mine and 7 level being at the bottom of the mine.[53] Between the batter levels sit benches and berms. Berms are relatively flat surfaces created in batters between working levels to stabilise the batter or intercept fretted material. Benches are horizontal flat surfaces created by the individual working levels.[54] The coal seam is naturally covered with overburden, which is made up of clay, gravel and soil. The overburden is removed in the mining process.[55] There are overburden dumps on the mine floor and external to the open cut.

FIRE HOLES

Some previous fires at the Hazelwood mine have been caused by fire holes. Fire holes occur naturally in the mine and are areas of heat within coal seams under the earth. As coal is fractious, fissures are created within the seams, allowing oxygen to reach a hot spot and ignite a fire.[56]

EXTENT OF THE FIRE

The extent of the Hazelwood mine fire can be assessed by considering the three figures below.

Figure 2.8 is a diagram prepared by Mr Ross Male, CFA Division Commander based at the Hazelwood mine overnight on 9 February 2014. It shows the three sectors of fire that ignited in the mine on 9 February 2014 and that were not quickly put out (albeit that the diagram is inaccurate in so far as it shows the area on fire in the northern batters). The location of 'the Knuckle', 'Old Faithful' fire hole (discussed below) and the operating area have been added to the map to assist the reader.

Figure 2.9 is an infra-red scan taken on 11 February 2014 showing the fires in the mine depicted by the red colouring.

Figure 2.10 shows the final extent of the Hernes Oak-McDonald's Track, Hernes Oak, Driffield and Hazelwood mine fires.

Figure 2.8 Diagram of the Hazelwood mine fire as at 7 am on 10 February 2014[57]

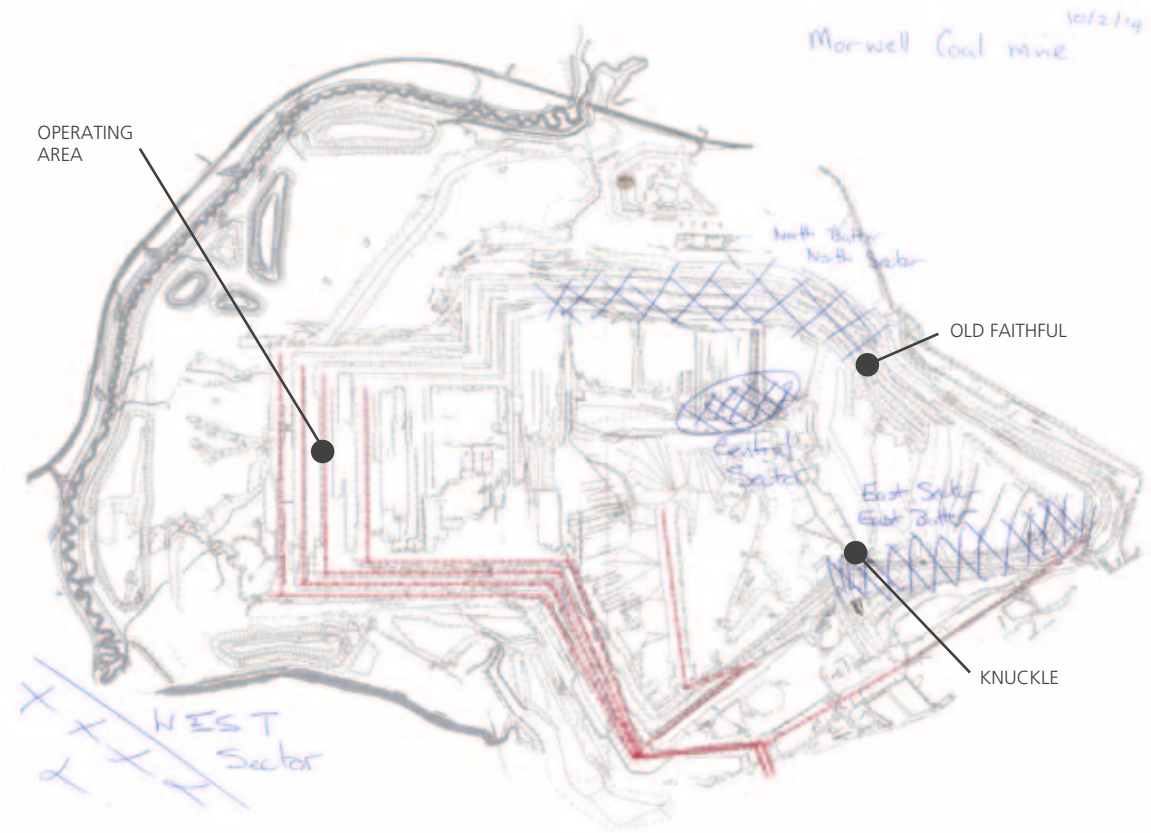


Figure 2.9 Infra-red line scan which identified the extent of the fires in the mine on 11 February 2014[58]

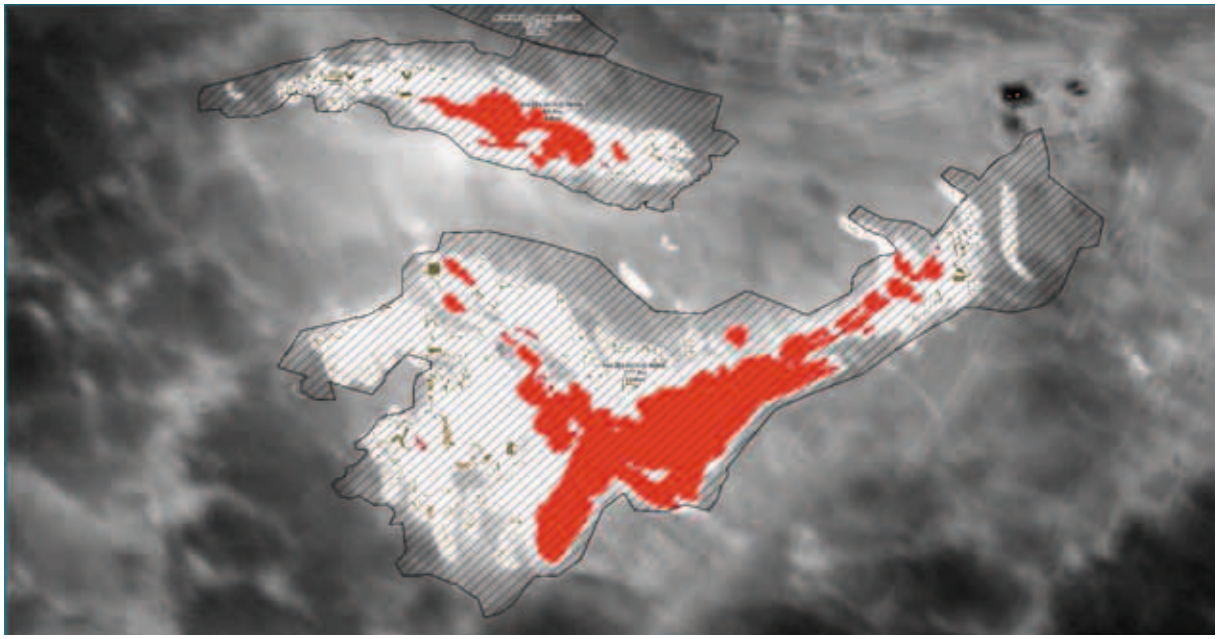
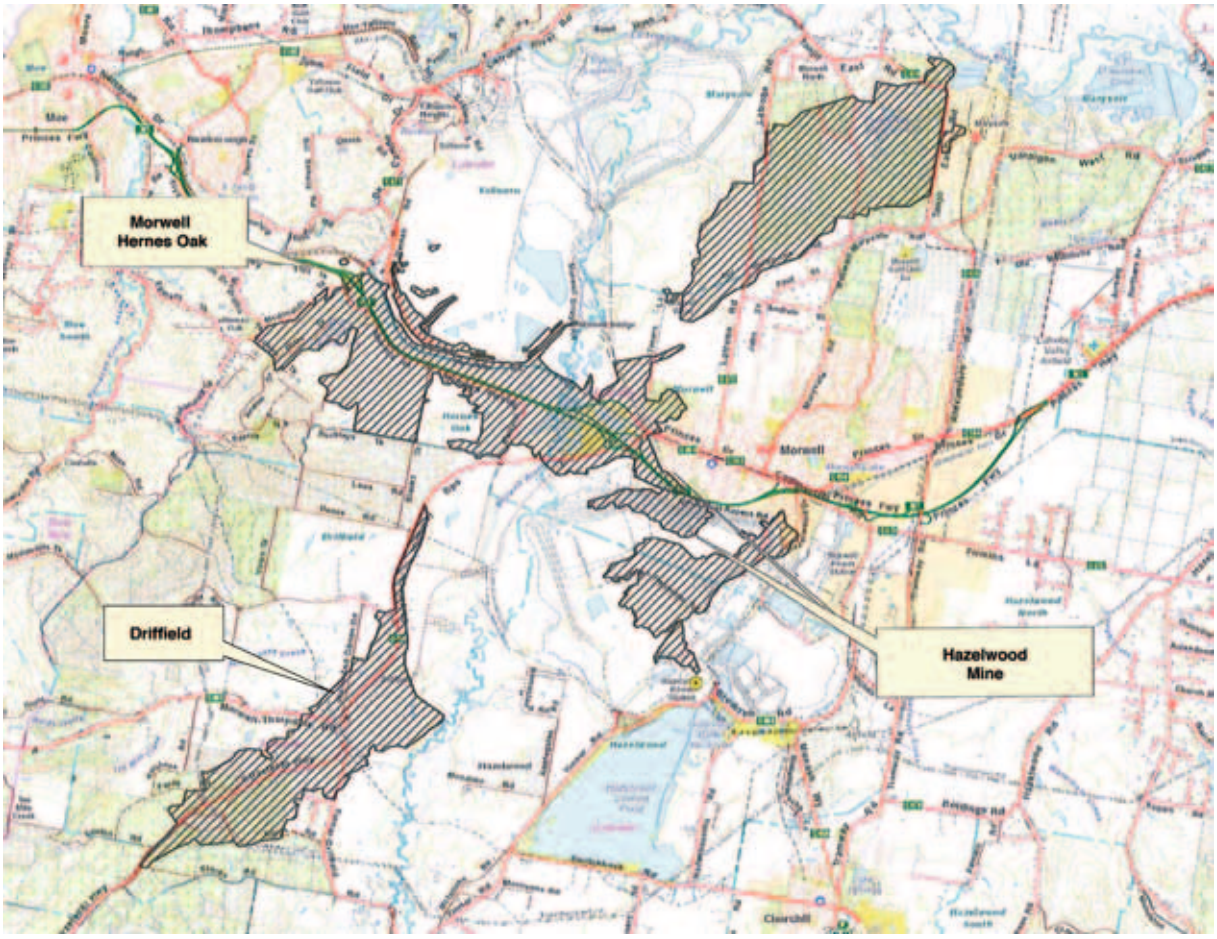


Figure 2.10 Extent of Hernes Oak and Driffield fires[59]



INITIAL OBSERVATIONS OF THE MINE FIRE

The Board heard direct accounts from several GDF Suez personnel of sightings of embers and fires within the mine. Photographs, logs, notes and videos recorded by various mine personnel support these accounts.

In considering the timeline of events on 9 February 2014, the Board has taken into account the evidence where the time was actually recorded (through digital photographs and contemporaneous notes), and considers that all other time references from personal recollection are an approximate 'best recollection' given the extreme circumstances faced that day.

The first observation of embers spotting into the mine was around 1.45 pm on 9 February 2014. Mr James Mauger, GDF Suez 1x7 Operator, observed embers travelling over his head into the mine from his position at the western boundary of the mine.[60]

The first recorded fire within the mine was close to what is known as 'the Knuckle'. Several GDF Suez personnel noticed this fire.[61]

Following this first sighting of fire in the mine, a number of mine personnel observed spot fires at 5 level in the northern batters and in the overburden dump in the mine floor between about 2 pm and 2.30 pm.[62]

The initial sighting of the fire in the northern batters was approximately 300 metres west of a clay-capped fire hole, known as 'Old Faithful' as shown in Figure 2.11. Mr Shanahan identified the clay capped fire hole by reference to the light coloured clay area which runs on an angle up from 5 level of the northern batters which is circled in Figure 2.11.

Figure 2.11 Fire at the northern batters at 2.57 pm on 9 February 2014[63]

This photograph was taken at 2.57 pm on 9 February 2014 from the western end of the northern batters, looking to the east. It shows fire on 3 level of the northern batters being doused with orange fire retardant by a water bomber, and smoke on 5 level below. The clay-capped fire hole known as "Old Faithful" is circled.

SPREAD OF THE MINE FIRE

The fires in the mine, once started, spread rapidly and extensively. The main factor responsible for that spread was the wind. For several hours a strong south-westerly wind drove the spread. The effect of that wind is visually apparent from Figure 2.6 above.

A sample of records from the Latrobe Airport weather station on 9 February 2014 showing times, and wind direction, speed and gusts is contained in Figure 2.12.[64]

Figure 2.12 Wind records from the Latrobe Airport on 9 February 2014

Time (pm)	Wind direction	Wind speed (km/h)	Wind gust (km/h)
12.00	NW	33	50
1.00	NW	37	57
2.00	SW	50	74
3.00	SW	52	67
4.00	SW	48	67
5.00	WSW	54	67
6.00	WSW	48	63
7.00	WSW	41	56
8.00	WSW	35	44
9.00	WSW	24	35
10.00	W	19	24

Figure 2.13 Fire burning beneath the power poles in the northern batters at 3.20 pm on 9 February 2014[65]

This image shows fire burning beneath power poles on 3 level of the northern batters at 3.20 pm. Mr Mauger took this photograph looking towards the power station in a south-easterly direction.

From approximately 2.30 pm on 9 February 2014, GDF Suez personnel observed the fire in the northern batters had spread from 5 level to 1 level and was burning power poles on the northern batters.[66] Mr Mauger estimated that it took 50 minutes from the time that he first saw the fire in the northern batters for all levels of the batters to ignite.[67]

By around 4 pm, fire on the floor of the mine near the overburden dump area was established.[68] There were also reports of spot fires in the operating area of the mine around this time.[69] The series of photographs in Figure 2.14 and 2.15 below document the fire on the northern batters at 4.24 pm and 4.27 pm.

Figure 2.14 Photograph of the northern batters taken in an easterly direction by Mr Shanahan at approximately 4.24 pm on 9 February 2014[70]

Figure 2.15 Photograph of the northern batters taken in an easterly direction by Mr Shanahan at approximately 4.27 pm on 9 February 2014[71]

By late afternoon, the fire in the south-eastern batters was extensive and posed a threat (through spotting) to the grass level above, and to the M690 conveyor (a key part of the mine's infrastructure).[72] In the early evening, GDF Suez personnel reported that fire had spotted out of the eastern batters and caused a grass fire between the mine and Energy Brix. This led to damage to the M690 conveyor and an Energy Brix conveyor.[73]

Fire was widespread in the Hazelwood mine by early evening on 9 February 2014.[74] Photographs taken by Mr Doug Steley, CFA Volunteer, show the extent of the fire overnight and in the morning (see Figures 2.16 and 2.17).

Figure 2.16 Fire in the south-eastern batters at 1.45 am on 10 February 2014[75]

This photograph was taken by Mr Steley at 1.45 am on 10 February 2014 from the south-eastern batters. It shows fire in the south-eastern batters in the foreground, and the northern batters alight in the background. The city lights of Morwell are visible in the distant background.

Figure 2.17 Mine fire in the northern batters at 7.40 am on 10 February 2014[76]

This photograph was taken by Mr Steley at approximately 7.40 am on 10 February 2014. Mr Steley was driving across the mine floor facing towards the northern batters.

HAZELWOOD MINE FIRE DECLARED SAFE

On 10 March 2014, the mine fire was declared under control. After 45 days of fighting the fire, the Fire Services Commissioner declared the Hazelwood mine fire 'safe' on 25 March 2014.[77]

EVIDENCE AS TO THE CAUSE OF THE HAZELWOOD MINE FIRE

The Board heard evidence about the cause of the fires within the Hazelwood mine from mine workers. Firefighting efforts are discussed in Chapter 2.3 Fighting the Hazelwood mine fire.

The Board also heard evidence from Mr Lapsley on the first day of the public hearings. In answering questions as to the cause of the fires in the mine, Mr Lapsley accepted that the fires could have been from spotting from the Hernes Oak fire or the Driffield fire.[78] Mr Lapsley's evidence was based on reports provided to him from mine personnel, personnel at the Energy Brix site and from members of the public who saw fires and smoke in the area.[79]

Supplementing the evidence of witnesses who directly observed the mine fire and from Mr Lapsley, the Board also heard evidence from Mr Jaymie Norris, Acting Manager, Stategic Bushfire Risk Assessment Unit at the Department of Environment and Primary Industries, about Phoenix Rapidfire modelling. Phoenix Rapidfire modelling is used to predict the spread of a fire and the occurrence of fire spotting. A more detailed discussion about Phoenix Rapidfire modelling is contained in Chapter 2.2 Preparing for fire.

Modelling provided the Board with additional guidance about the probability that embers spotting from each of the Hernes Oak and Driffield fires caused or contributed to the mine fire. As to which fire potentially contributed more embers, it provided no clear answer.

While Mr Incoll was not directly asked to express an opinion on the cause of the mine fire, he accepted that embers did spot into the mine from the Hernes Oak fire and could have spotted from the Driffield fire based on the prevailing weather conditions.[80]

DISCUSSION AND CONCLUSIONS

Based on the evidence, the Board concludes that the Hazelwood mine fire was caused by embers spotting into the mine. There is no evidence to suggest that the Hazelwood mine fire started from a source inside the mine, either in the operating area or from an existing fire hole.

It seems more likely that the spotting was caused by the Hernes Oak fire and possibly from the Driffield fire.

The Board accepts the opinion of Mr Lapsley regarding the cause of the mine fire given that there is strong support for it in the evidence and that there is no evidence to the contrary.

Under its Terms of Reference, the Board has been directed not to prejudice any investigation by Victoria Police. Accordingly, the Board does not reach any conclusions about the causes of the Hernes Oak-McDonald's Track, Hernes Oak and Driffield fires.

The Board acknowledges that appropriate warnings were made in the lead up to 9 February 2014 about the potential risk of a catastrophic fire event occurring. However, warnings are only a short-term solution. In the long-term the emphasis needs to be on education based on past experience. Education is particularly important for those Victorians living in areas most vulnerable to bushfire.

While no two fires are the same, parallels can be drawn between the cause, course and consequences of fires. It is imperative that we learn from fire events, and that Victorians are educated about the threat of fire and how to improve preparation measures for the future.

1. Country Fire Authority Vic 2014, media conference, Melbourne, 8 February 2014, Interview with the Fire Services Commissioner Craig Lapsley, viewed 22 July 2014, https://soundcloud.com/cfavic/fire-services-commissioner-2
2. Commonwealth Scientific and Industrial Research Organisation 2014, *State of the Climate – Heatwaves and Fire weather*, CSIRO, Canberra, viewed 22 July 2014, http://www.csiro.au/Outcomes/Climate/Understanding/State-of-the-Climate-2014/Heatwaves-and-Fireweather.aspx
3. Exhibit 92 – Expert report of Roderic Incoll, paras 236-238
4. Exhibit 92 – Expert report of Roderic Incoll, paras 238 & 239
5. Incoll T2156:4-28
6. Exhibit 92 – Expert report of Roderic Incoll, paras 239-243
7. Exhibit 60 – Statement of Robert Gaulton, paras 8-13
8. Exhibit 1 – Statement of Craig Lapsley, para. 14
9. Exhibit 1 – Statement of Craig Lapsley, para. 16
10. Adapted from Exhibit 1 – Statement of Craig Lapsley, para. 17
11. Exhibit 1 – Statement of Craig Lapsley, para. 15
12. Adapted from Exhibit 1 – Statement of Craig Lapsley, para. 17
13. Bureau of Meteorology 2014, *Latrobe Valley, Victoria January 2014 Daily Weather Observations*, BOM, Melbourne, viewed 28 July 2014, http://www.bom.gov.au/climate/dwo/201401/html/IDCJDW3042.201401.shtml; Exhibit 74 – Bureau of Meteorology weather information
14. Exhibit 1 – Statement of Craig Lapsley, para. 27; Exhibit 46 – Statement of Rosemary Lester, paras 1, 17 & 18; Country Fire Authority 2014, *Extreme fire danger this weekend*, CFA, Melbourne, viewed 28 July 2014, http://54.206.65.35/news/extreme-fire-danger-this-weekend.html;
15. Exhibit 1 – Statement of Craig Lapsley, para. 36
16. Exhibit 1 – Statement of Craig Lapsley, para. 46 attachment, Fire Investigation Management System - Bushfire Report Fire & Incident Reporting System: 495857 (CFA.0002.001.0159)
17. Exhibit 15 – Statement of Lawrence Jeremiah, para. 18
18. Exhibit 1 – Statement of Craig Lapsley, para. 71
19. Exhibit 15 – Statement of Lawrence Jeremiah, para. 45
20. Exhibit 1 – Statement of Craig Lapsley, para. 73
21. Exhibit 1 – Statement of Craig Lapsley, para. 75
22. Exhibit 6 – Statement of Jaymie Norris, Phoenix Rapidfire presentation, p. 9
23. Exhibit 1 – Statement of Craig Lapsley, para. 54; Exhibit 15 - Statement of Laurence Jeremiah, para. 12 (c)
24. Exhibit 1 – Statement of Craig Lapsley, para. 48
25. Exhibit 6 – Statement of Jaymie Norris, Phoenix Rapidfire presentation, p. 10
26. Exhibit 8 – Statement of James Mauger, para. 22
27. Exhibit 15 – Statement of Lawrence Jeremiah, para. 70
28. Exhibit 74 – Bureau of Meteorology weather information
29. Exhibit 92 – Expert report of Roderic Incoll, appendix 3
30. Exhibit 92 – Expert report of Roderic Incoll, appendix 3
31. Exhibit 6 – Statement of Jaymie Norris, Phoenix Rapidfire presentation, p. 12
32. Exhibit 6 – Statement of Jaymie Norris, Phoenix Rapidfire presentation, p. 10
33. Exhibit 7 – Statement of David Shanahan, paras 51-55
34. Exhibit 7 – Statement of David Shanahan, para. 55
35. Exhibit 7 – Statement of David Shanahan, para. 55
36. Exhibit 15 – Statement of Lawrence Jeremiah, para. 70
37. Exhibit 1 – Statement of Craig Lapsley, para. 88
38. Exhibit 1 – Statement of Craig Lapsley, para. 89
39. Exhibit 1 – Statement of Craig Lapsley, para. 46 attachment, Fire Investigation Management System - Bushfire Report Fire & Incident Reporting System: 495857 (CFA.0002.001.0159); Lapsley T36:26 – T37:2
40. Exhibit 1 – Statement of Craig Lapsley, para. 46; Lapsley T36:31 – T37:2; T151:26 – T152:2; Exhibit 5 – Affidavit of Michael Roberts, paras 4-14
41. Exhibit 5 – Affidavit of Michael Roberts, para. 11
42. Exhibit 1 – Statement of Craig Lapsley, para. 55
43. Exhibit 7 – Statement of David Shanahan, para. 49
44. Exhibit 15 – Statement of Lawrence Jeremiah, paras 75 & 76
45. Exhibit 74 – Bureau of Meteorology weather information
46. Exhibit 10 – Statement of Steven Harkins, para. 107
47. Roach T654:27-30
48. Exhibit 5 – Affidavit of Michael Roberts, paras 5-8; Exhibit 17 – Supplementary affidavit of Michael Roberts, para. 6(a)
49. Exhibit 1 – Statement of Craig Lapsley, para. 51; Lapsley T43:12-24; Exhibit 5 – Affidavit of Michael Roberts, paras 4-14
50. Exhibit 5 – Affidavit of Michael Roberts, para. 12; Exhibit 17 – Supplementary affidavit of Michael Roberts, para. 6
51. Exhibit 29 – Second statement of Steven Harkins, para. 31
52. Polmear T2034:15-22
53. Shanahan T233:26-28
54. Exhibit 4 – Statement of William Brown, attachment WB–3

55. Exhibit 29 – Second statement of Steven Harkins, para. 31
56. Dugan T412:15-21
57. Adapted from Exhibit 10 – Statement of Steven Harkins, annexure 14
58. Exhibit 99 - Hazelwood mine fire infra-red line scan from 11 February 2014
59. Victorian Government Documents, 9 April 2014, Traralgon ICC Managed Fires (FSC.0001.001.0006)
60. Exhibit 8 – Statement of James Mauger, para. 27
61. Exhibit 8 – Statement of James Mauger, paras 32 & 33; Exhibit 7 – Statement of David Shanahan, para. 47
62. Exhibit 7 – Statement of David Shanahan, para. 56; Exhibit 25 – Log of events produced by Mr Roach; Exhibit 8 – Statement of James Mauger, para. 36; Prezioso T364:10-13, T364:8-9; Roach T647:18 – T648:10
63. Exhibit 7 – Statement of David Shanahan, para. 67; Shanahan T233:7-T234:13
64. Exhibit 91 - Expert report of Roderic Incoll, appendix 3
65. Exhibit 8 – Statement of James Mauger, para. 41
66. Exhibit 7 – Statement of David Shanahan, para. 64; Exhibit 8 – Statement of James Mauger, paras 39-41
67. Exhibit 8 – Statement of James Mauger, para. 43
68. Exhibit 10 – Statement of Steven Harkins, para. 71
69. Exhibit 7 – Statement of David Shanahan, para. 47
70. Exhibit 7 – Statement of David Shanahan, para. 79
71. Exhibit 7 – Statement of David Shanahan, para. 81
72. Exhibit 7 – Statement of David Shanahan, paras 86 & 87
73. Exhibit 7 – Statement of David Shanahan, paras 89 & 90; Exhibit 10 – Statement of Steven Harkins, para. 86
74. Exhibit 8 – Statement of James Mauger, para. 46
75. Exhibit 24 – Statement of Doug Steley, para. 12
76. Exhibit 24 – Statement of Doug Steley, para. 20
77. Exhibit 1 – Statement of Craig Lapsley, para. 139
78. Exhibit 1 – Statement of Craig Lapsley, paras 50, 52 & 57
79. Exhibit 1 – Statement of Craig Lapsley, para. 62
80. Exhibit 92 – Expert report of Roderic Incoll, paras 246 & 247

2.2 PREPARING FOR FIRE

OVERVIEW

The Terms of Reference require the Board of Inquiry to consider and report on the adequacy and effectiveness of the application and administration of the relevant regulatory regimes in relation to the State's response to fire at the Hazelwood mine. Further, the Board must consider and report on the adequacy and effectiveness of the measures taken by GDF Suez to be prepared to respond to an outbreak of a fire in the Hazelwood mine.

At the time of the Hazelwood mine fire, the *Emergency Management Act 1986* (Vic) and the Emergency Management Manual Victoria governed emergency preparation and planning by the State. It is the application of this regulatory framework that the Board considers in this Chapter. The *Emergency Management Act 1986* (Vic) is now in the process of being replaced by the *Emergency Management Act 2013* (Vic).

A range of internal policies direct the planning measures that GDF Suez must undertake in relation to adequate preparation for emergencies, and specifically mine fires.

The Board heard evidence from fire services personnel regarding the preparation and planning measures adopted by fire services at the incident, regional and state levels. The Board also heard evidence from GDF Suez personnel about the content of various policies and the implementation of preparatory measures prior to the Hazelwood mine fire.

The State was faced with a number of competing resource demands prior to and during the extreme fire conditions on 8 and 9 February 2014. In light of these competing demands, the Board considers that the measures adopted by fire services were generally appropriate. The Board acknowledges that the Traralgon Incident Control Centre was put under significant pressure because the Yarram base Incident Control Centre was not established on 8 and 9 February 2014. That pressure was compounded by the slow delivery of requested additional firefighting resources.

The Board concludes that GDF Suez's fire planning measures failed to address preventative steps to be taken by mine personnel in the areas of the mine where the reticulated fire service water system was not installed or installed only to a limited extent.

The Board concludes that while fire planning measures were implemented by GDF Suez personnel in accordance with its policies, those plans were prepared on Friday, 7 February 2014 and not updated to reflect the changing and serious conditions when the Hernes Oak–McDonald's Track fire became a significant threat to the Hazelwood mine. Fire planning by GDF Suez failed to reconsider the staffing levels and other protective measures that the mine planned to implement over the weekend. GDF Suez should have increased the number of staff at the mine. GDF Suez should have required senior managers to be onsite to take control of the fire threat to ensure mine operations crews were able to undertake spotting patrols and attend to any fires that did start. GDF Suez should have ensured that personnel designated to take charge in the event of a fire in the mine were adequately prepared.

Further, the Board considers that GDF Suez failed to fully appreciate the risks facing the mine from the Hernes Oak–McDonald's Track fire. This failure was partly the fault of its personnel. Opportunities to obtain relevant and significant information about fire risks and predictive modelling of the potential fire spread, assuming the fire broke containment lines, were not taken by mine personnel. Equally, information passed on to mine personnel was not communicated in a manner that enabled full comprehension.

GDF Suez is the operator of a brown coal mine in a bushfire prone area. The consequences of a fire in the mine could be, and indeed were, catastrophic. It was therefore critical that the mine was prepared for the fire risks in the most comprehensive manner. The Board considers that GDF Suez did not prepare to the level necessary given the extreme fire risks it was facing on 9 February 2014.

The discussion and conclusions in this Chapter relate only to the application of the preparation measures in the lead up to the Hazelwood mine fire. Discussion on the adequacy and effectiveness of the preparation measures as they were implemented during firefighting are discussed in Chapter 2.3 Fighting the Hazelwood mine fire.

STATE PLANNING FOR FIRE

Victoria has a multi-agency framework for emergency management, some elements of which are legislated and other elements of which are established by agreement.[1]

The Victorian emergency management framework is currently undergoing significant reform. At the time of the Hazelwood mine fire, the *Emergency Management Act 1986* (Vic) (Emergency Management Act) and the Emergency Management Manual Victoria governed emergency management in Victoria.

The *Emergency Management Act 2013* (Vic) came into operation on 1 July 2014. The focus of the new Act is the establishment of key statutory positions under new governance arrangements, including the creation of an Emergency Management Commissioner, which succeeds the role of the Fire Services Commissioner. The Emergency Management Commissioner will have broader oversight, control and coordination in relation to emergencies.

Future legislation is planned to progressively repeal and replace the Emergency Management Act, but at the time of writing this report, it remains in force and needs to be read in conjunction with the *Emergency Management Act 2013* (Vic).[2]

The position of the Fire Services Commissioner was established following the 2009 Victorian Bushfires Royal Commission. Mr Craig Lapsley was the Fire Services Commissioner at the time of the Hazelwood mine fire. He has since been appointed as the first Emergency Management Commissioner under the new legislative arrangements.[3]

Any reference to the Emergency Management Act in this report should be read to mean the *Emergency Management Act 1986* (Vic), as in force prior to 1 July 2014.

EMERGENCY MANAGEMENT ACT

The Emergency Management Act establishes the command, control and coordination arrangements for emergencies in Victoria. 'Emergency' is defined in s. 4 of the Act to include the actual or imminent occurrence of an event, including fire, which in any way endangers or threatens to endanger the safety or health of persons in Victoria, damages or threatens to damage property in Victoria, or endangers or threatens to endanger the environment in Victoria.

Section 16 of the Emergency Management Act provides that the Fire Services Commissioner has overall control of response activities to a 'major fire' in any area of Victoria.

A 'major fire' is defined as a large or complex fire which:

(a) has the potential to cause or is causing loss of life and extensive damage to property, infrastructure or the environment; or

(b) has the potential to have or is having significant adverse consequences for the Victorian community or part of the Victorian community; or

(c) requires the involvement of two or more fire services agencies to suppress the fire; or

(d) will, if not suppressed, burn for more than one day.[4]

EMERGENCY MANAGEMENT MANUAL VICTORIA

The Emergency Management Manual Victoria is a single multi-part book integrating the principal policy and planning documents for emergency management in Victoria.[5]

Part 3 of the Emergency Management Manual Victoria is the State Emergency Response Plan for the coordinated response of all agencies having roles or responsibilities in relation to the response to emergencies. The Minister for Police and Emergency Services is required to prepare this plan under s. 10(1) of the Emergency Management Act. The Minister has delegated responsibility for preparing the State Emergency Response Plan to the Chief Commissioner of Police.[6]

Part 7 of the Emergency Management Manual Victoria lists the responsible emergency service agencies for each type of emergency. For each different type of emergency, whether it is a house fire in metropolitan Melbourne, a whale stranding, a bushfire in a national park, a pandemic, or an oil spill, the Emergency Management Manual Victoria nominates a control agency to lead the response.[7]

The Emergency Management Manual Victoria allocates responsibility for responding to fire in Victoria to different agencies depending on the location of the fire, as follows:

- Country Fire Authority (CFA)—fire on private land within the country area of Victoria (such as the Hazelwood mine)[8]
- Department of Environment and Primary Industries (DEPI)—fire in State Forest, National Park and Protected Public Lands[9]
- Metropolitan Fire Brigade (MFB)—fire in metropolitan areas.[10]

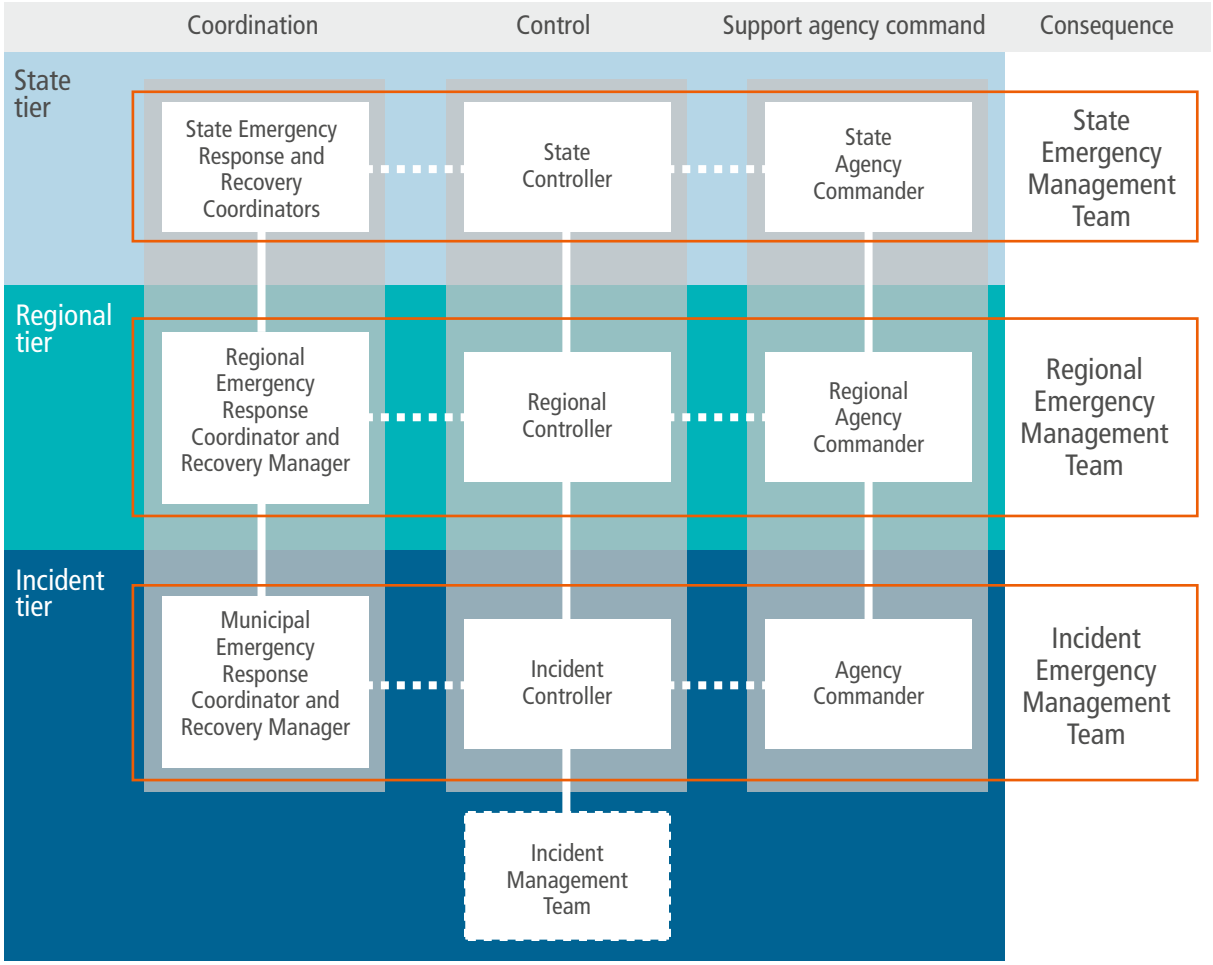
The control agency responsible for leading the response to a 'major fire' in Victoria is the Fire Services Commissioner, supported by the CFA, DEPI or MFB (depending on the location of the fire).[11] This reflects the Fire Services Commissioner's statutory role as mandated by s. 16 of the Emergency Management Act.

TIERS OF EMERGENCY MANAGEMENT

The State Emergency Response Plan adopts a three-tiered approach to emergency management in Victoria—state, regional and incident.[12] This three-tiered approach is standard protocol during major emergencies and is an outcome of the implementation of recommendation 63 of the 2009 Victorian Bushfires Royal Commission (Teague, McLeod, & Pascoe, 2010, p. 6). The Fire Services Commissioner has issued 'State Command and Control Arrangements for Bushfire in Victoria 2013' as a supplement to the Emergency Management Manual Victoria. This document clarifies how the State Emergency Response Plan is to be implemented in the event of bushfires.[13]

A representation of the State Emergency Response Plan tiers of emergency management as applied in a bushfire scenario is shown in Figure 2.18.

Figure 2.18 The State Emergency Response Plan tiers of emergency management[14]



As shown in Figure 2.18, each tier within the structure includes a position responsible for command, control and coordination. Command refers to the direction of personnel and resources of an agency in the performance of the agency's role and tasks. Control involves the overall direction of response activities in an emergency and runs across agencies. Coordination involves the bringing together of agencies and resources to ensure effective response to and recovery from emergencies. Victoria Police is the coordination agency for response and the Department of Human Services is the coordination agency for recovery.[15]

For bushfires, the positions responsible for control at each tier of emergency management are the State Controller, Regional Controller and Incident Controller. These positions are referred to collectively as the 'line-of-control'. The State Command and Control Arrangements explain that:

> The purpose of the line-of-control for bushfire in Victoria is to ensure an operational, informational and evaluative connection between the controllers at each tier so that the [Fire Services Commissioner], who has legislative accountability for the control of major fire and is the State Controller for bushfire, is assured that the needs of the community are being met.[16]

The roles of the State Controller, Regional Controller and Incident Controller are explained in further detail below.

The fire services agencies responding to an emergency retain command of their own resources and maintain their own chain-of-command. Firefighters on the ground report up through the chain-of-command within the relevant emergency service organisation (for example, the CFA),to the Incident Controller.[17]

In 2013, the 2009 Victorian Bushfires Royal Commission Implementation Monitor reviewed the state bushfire readiness arrangements that established this integrated and coordinated structure for emergency response across agencies. The Implementation Monitor found that the current structures of emergency management have improved operability across agencies (Comrie, 2013, p.19).

EMERGENCY RESPONSE AND RECOVERY COORDINATORS

Section 11(1) of the Emergency Management Act specifies that during an emergency the Chief Commissioner of Police steps into the role of the State Emergency Response Coordinator (see Figure 2.18). The State Emergency Response Coordinator coordinates agencies with roles or responsibilities in responding to emergencies. Where more than one emergency is happening at a time, the State Emergency Response Coordinator is required to take action to ensure effective control and coordination across all emergencies.[18]

Emergency Response Coordinators can also be established at the regional and incident tier to support Regional and Incident Controllers respectively. Emergency Response Coordinators form part of the Emergency Management Team.[19]

STATE CONTROLLER

The State Controller's role is to provide strategic leadership for the resolution of emergencies at the highest level, and where there may be significant political or economic impact.[20] Key functions of the State Controller are to:

- establish a control structure and a State Emergency Management Team
- ensure coordination between agencies
- ensure risk or threat identification and mitigation
- provide tailored information to the community and agencies about emergencies
- ensure warnings are issued
- ensure community relief arrangements are in place.[21]

Pursuant to s. 16 of the Emergency Management Act, the State Controller may appoint a Deputy, a Chief Officer, or another officer from an emergency service agency, such as the CFA, DEPI, MFB or the Victoria State Emergency Service (SES). The State Controller's appointee assumes overall control of response to a major fire. The State Controller (or the person appointed to perform that role) may exercise the power and authority granted to the Chief Officer of the CFA by the *Country Fire Authority Act 1958* (Vic) (CFA Act).

When the Fire Services Commissioner takes control of a major fire, the Fire Services Commissioner becomes the State Controller. Under Standard Operating Procedures Control of Major Fires SOP 05/2011, the Fire Services Commissioner automatically assumes the role of the State Controller when the following conditions are present:

- a Code Red Fire Danger Rating is in place in one or more forecast districts
- an Extreme Fire Danger Rating is in place in three or more forecast districts.[22]

These conditions were present on 9 February 2014.[23]

REGIONAL CONTROLLER

The role of the Regional Controller is to provide leadership and management across emergencies within a Victorian region. For the extent of the bushfire season, the Fire Services Commissioner approves the appointment of rostered Regional Controllers to take charge and provide strategic leadership for bushfire readiness and response in each region.[24]

INCIDENT CONTROLLER

Under the State Emergency Response Plan, the role of the Incident Controller is to provide leadership and management at the emergency incident.[25] In the context of a bushfire, the Incident Controller is accountable for the overall direction of response activities.[26] An accredited and experienced Incident Controller is normally appointed from within the relevant agency responsible for responding to a particular fire. However, to prepare for days of high fire risk, or for major bushfires, the State Controller or Regional Controller may appoint an Incident Controller from any agency.[27]

EMERGENCY RESPONSE PLANNING

At each tier of emergency management (state, regional and incident), emergency response plans are prepared. Emergency response plans include:

- objectives
- the State Controller's strategic priorities
- hierarchical emergency management structures
- fire risk identification
- response strategies or other actions
- resource requirements
- evacuation planning
- communication with the community.[28]

STATE CONTROLLER'S STRATEGIC PRIORITIES

The State Controller has established strategic priorities to guide decisions about the allocation of resources when responding to emergencies. These strategic priorities are:

- the protection and preservation of life is paramount
- issuing community information and community warnings
- protection of critical infrastructure and community assets
- protection of residential property
- protection of assets supporting individual livelihoods and economic production
- protection of environmental and conservation assets.[29]

RESOURCE REQUIREMENTS

The Standard Operating Procedures also govern resource allocation in response to fires. The objective of 'Readiness arrangements for Incident Management Teams' under Standard Operating Procedure J2.03 is to ensure the State has Incident Management Teams pre-positioned to manage major bushfires or potential major bushfires.[30]

An Incident Management Team comprises an Incident Controller supported by personnel responsible for the incident management functions identified in the State Emergency Response Plan. The Incident Management Team applies the Australasian Inter-service Incident Management System (AIIMS).[31]

AIIMS is a nationally recognised system of incident management for emergency services agencies. AIIMS is based on five key principles—flexibility, management by objectives, functional management, unity of command and span of control. These principles ensure that the Incident Management Team is only working to one set of objectives at any one time, that the team is managing the incident with five functional areas (control, planning, public information, operations and logistics), and that there is a limit to the number of groups that can be supervised by one Incident Controller.[32]

Standard Operating Procedure J2.03 contains several schedules, including:

- the weather forecast location for each Incident Control Centre (Schedule 1)
- levels of an Incident Management Team for readiness purposes (Schedule 2)
- Incident Control Centre footprints and clusters (Schedule 3)
- staffing of Incident Management Teams depending on the fire circumstances (Schedule 4).[33]

Schedule 4 of Standard Operating Procedure J2.03 identifies 17 Incident Control Centre clusters in Victoria. The Traralgon Incident Control Centre is the designated Primary Incident Control Centre for the South and West Gippsland cluster. The footprints within that cluster are Traralgon, Erica, Noojee, Ellinbank, Leongatha and Yarram. The Schedule provides that on days of extreme fire danger, the minimum Incident Control Centre readiness arrangement for the Traralgon Incident Control Centre is a core Incident Management Team, with other Incident Control Centres in the cluster required to have base Incident Management Team readiness arrangements in place to spread the workload.[34]

Schedule 2 of Standard Operating Procedure J2.03 provides that the staffing requirement for a core Incident Management Team include:

- Control: Incident Controller (Level 2 or Level 3) (a Deputy Incident Controller is also recommended)
- Operations: Operations Officer, Aircraft Officer and Radio Officer
- Planning: Planning Officer, Situation Officer and Resources Officer
- Public Information: Warnings and Advice Officer (or Public Information Officer)
- Logistics: Logistics Officer.[35]

Specialist roles such as Aircraft Officers can be centrally based in the Regional Control Centre rather than in the core Incident Management Team.[36]

A base Incident Management Team is staffed by an Incident Controller (Level 2 or Level 3), an Operations Officer, a Radio Operator or Administration, and a Warnings and Advice Officer (or Public Information Officer).[37]

Levels of resources may exceed or fall under the levels described for readiness in Standard Operating Procedure J2.03 with the prior approval of the State Controller.[38]

FIRE RISK IDENTIFICATION

The Phoenix Rapidfire modelling system is a tool used extensively in Victoria to assist with emergency response planning. It was developed as a research tool by the University of Melbourne in 2006 and gained recognition in international journals from as early as 2008 (Tolhurst, Chong, & Strandgard, 2006; Tolhurst, Shields, & Chong, 2008). Phoenix Rapidfire modelling is used operationally during emergencies

through an agreement between DEPI, the University of Melbourne and the Bushfire and Natural Hazards Cooperative Research Centre (DEPI, 2013, p. 8).

Phoenix Rapidfire models simulate the potential spread of a fire. The model can predict where the fire will spread, the potential assets that might be affected by the spread of the fire and where spotting may occur.[39] A depiction of a Phoenix Rapidfire model is shown in Figure 2.19 below.

Figure 2.19 Phoenix Rapidfire modelling[40]

Figure 2.19 is a Phoenix Rapidfire model that was produced during the public hearings which shows both the predicted fire behaviour (in orange, yellow and red) as well as the actual extent of the Driffield fire (in brown) on 9 February 2014.

To develop the Phoenix Rapidfire models, information and assumptions about fire behaviour are entered into the software program. Relevant information and assumptions include the point of origin of the fire, the time of ignition, weather predictions (expected temperature, wind speed, wind direction, cloud cover and atmospheric conditions) and the vegetation in the landscape that may fuel the fire. The type of fire fuel is predicted based on best available information from aerial photography and other records. The model assumes that no fire suppression will occur.[41]

Phoenix Rapidfire modelling is limited by the accuracy of the information inputs, including:

- fuel types
- wind reduction factors
- fire history
- topography
- assets and values
- road proximity
- fuel disruptions
- weather
- suppression resources
- grassland curing.[42]

Mr Jaymie Norris, Acting Manager of the Strategic Bushfire Risk Assessment Unit of DEPI, gave evidence to the Board that the Phoenix Rapidfire modelling system is less realistic when areas of significant assets, for example cities, power stations and water treatment plants, are located in the fire landscape. Where there is an uneven distribution of dense forest and grassland, the simple fire suppression algorithm is also less likely to be realistic.[43]

Fire fuel cannot be measured in all forested areas, therefore assumptions are made about the fuel load, using information such as, the number of years since the last fire in that forest. This information can then be used to estimate how much leaf litter and debris has accumulated on the forest floor.[44]

STATE PLANNING WITH SUPPORT AGENCIES AND THE COMMUNITY

The State engages with support agencies and relevant community members in planning and managing an emergency in circumstances where agency support and community involvement is considered necessary. In such circumstances, an Incident Emergency Management Team is formed. The Incident Emergency Management Team brings together representatives from each of the lines of control (command, control and coordination) at incident level (see Figure 2.18 above). In addition, community members and other relevant entities can be included. The Incident Emergency Management Team is a forum for informing the Incident Controller about the likely impacts and consequences of an emergency, and enables all members to contribute to the development of the overall incident strategy.[45]

An Incident Emergency Management Team was formed to respond to the fire conditions in the days leading up to the Hazelwood mine fire. Members of the Incident Emergency Management Team included representatives from various support agencies and local government. SP AusNet, Hancock Victorian Plantations Pty Ltd, Gippsland Water and Central Gippsland Essential Industries Group Inc. were also members.[46]

The Central Gippsland Essential Industries Group (CGEIG) is a regional industry group comprising Latrobe Valley electricity generators, electricity suppliers, oil and gas suppliers, paper producers and major suppliers. GDF Suez is a member of the CGEIG.[47] Operating since the 1990s, the CGEIG provides a network for information flow to support members in the event of an emergency. According to its website, the CGEIG 'provides a single point contact between Emergency Services Agencies and Key Industries during major events'.[48] The 'Central Gippsland Essential Industries Group Mutual Aid Guidelines December 2010' outlines the support members of the CGEIG can provide to each other in the event of an emergency.[49]

Mr Lawrence Jeremiah, Incident Controller on 9 February 2014, indicated that the CGEIG relationship was of assistance when he was the Deputy Incident Controller during the Churchill fire in 2009.[50]

GDF SUEZ PLANNING FOR FIRE

REGULATORY REGIME

As an employer, GDF Suez has a range of obligations under the *Occupational Health and Safety Act 2004* (Vic) (OHS Act) and the Occupational Health and Safety Regulations 2007 (Vic) (OHS Regulations).

Chapter 3.2 Regulation of fire risk at the Hazelwood mine provides a detailed discussion of the occupational health and safety (OHS) regime. GDF Suez's compliance with the OHS regime is discussed in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

GDF Suez's obligation to be prepared to respond to an outbreak of fire arises principally from its duty to:

- provide and maintain a working environment for employees that is, so far as is reasonably practicable, safe and without risks to health[51]
- ensure, so far as is reasonably practicable, that persons other than employees (including firefighters, visitors and members of surrounding communities) are not exposed to risks to their health or safety arising from the conduct of the undertaking of the employer.[52]

GDF Suez is also required to undertake a process of continuous improvement of its fire preparedness measures and to review, and if necessary, revise these measures following an incident.[53]

FIRE PREPAREDNESS AND RESPONSE MEASURES ADOPTED BY GDF SUEZ

GDF Suez maintains a number of fire management policies and procedures, including the following:

- Emergency Response Plan – Hazelwood Mine (revised May 2013)
- Mine Fire Service Policy and Code of Practice (revised July 2013)
- Hazelwood Mine Fire Instructions (issued 27 July 2011)
- Internal Grass Slashing – Specification for Grass Mowing (issued 17 October 2011)
- Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning (issued 13 September 2007)
- Check List for Fire Fighting Equipment Annual Inspection (issued 18 January 2013)
- Check List for Season Specific Fire Preparedness and Mitigation Planning (issued 24 November 2008)
- Check List for Hazelwood Slot Bunker Fire Services Wash Down & Routine Inspection (issued 18 January 2013)
- Mine Fireman Assessment (issued 24 February 2012)
- Fire Person Duties Training Manual (issued 23 August 2012)
- GDF Suez Hazelwood Electricity Safety - Bushfire Mitigation Plan (for the period commencing 1 July 2013).[54]

While a number of these fire management policies and procedures include measures specifically directed to preparedness and response to fire, some also address measures designed to prevent fire and mitigate its spread and severity. These are discussed in detail in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

The Emergency Response Plan – Hazelwood Mine (revised May 2013) (Emergency Response Plan) and the Hazelwood Mine Fire Instructions (issued 27 July 2011) (Mine Fire Instructions), are the principal plans relevant to a fire emergency at the Hazelwood mine.[55]

Relevantly, r. 5.3.34 of the OHS Regulations requires GDF Suez, as the operator of a 'prescribed mine', to prepare an emergency plan for the Hazelwood mine and use this plan as the primary means of responding to incidents involving a significant risk of serious injury or death.[56] The emergency plan prepared in accordance with the OHS Regulations must address all aspects of emergency response, including:

- ensuring that a system exists that enables all persons within the mine at any given time to be promptly located
- providing adequate rescue equipment
- ensuring that persons trained in the use of rescue equipment are available on site, or are on call, whenever any person is working at the mine.[57]

The emergency plan must also be prepared with the CFA. When the emergency plan addresses 'major mining hazards' that could detrimentally affect the health or safety of people in the area surrounding the mine, the Latrobe City Council must also be involved in its preparation.[58] GDF Suez is required to provide a copy of the emergency plan to the CFA and to test the plan, jointly with the CFA, at least once a year to ensure its continued effectiveness.[59]

The Emergency Response Plan sets out guidelines for combatting major emergencies (including fire) and interfacing with external agencies such as the CFA. The Emergency Response Plan states that it complies with Emergency Management Act requirements, and is compatible with the State Emergency Response Plan.[60]

Mr Robert Dugan, GDF Suez Mine Production Manager, provided evidence to the Board that GDF Suez's fire preparedness and response measures have evolved considerably as a result of learnings from previous fire incidents at the Hazelwood mine.[61] A review of previous fires at the Hazelwood mine and an analysis

of whether GDF Suez had implemented recommendations arising from those incidents is contained in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

The fire preparedness and response measures developed by GDF Suez fall under the following key areas:

- water supply
- power supply
- communications
- firefighting plant and equipment
- firefighting personnel and training
- routine auditing of level of preparedness
- emergency response planning.

WATER SUPPLY

The Hazelwood mine features a reticulated fire services water system, which has historically been referred to as the 'fire service network'.[62] According to Mr Dugan:

> The system consists of a pipe network which supplies water to sprays and hydrants (including tanker filling points) in the Mine. The hydrants have CFA compatible threads. The system is powered by a series of electric pumps located in the sector 4 pond in the floor of the Mine. There is also a clean water pump station, which de-waters the aquifer beneath the Mine and then conveys the artesian water to the Hazelwood pondage. This water can be diverted into the Hazelwood Mine fire services pipe network through the H section valve. Water can also be pumped back from the Hazelwood cooling pondage into the pipe network, utilising pumps 50 and 53. The Low Quality Water pipeline from Loy Yang A (owned by AGL) allows water to be pumped back into the Mine via C and D tanks.[63]

There is also a gravity fed water supply from Loy Yang that delivers water to two tanks on the ridge next to the Hazelwood Power Station and supplies water to the mine via a gravity feed.[64]

The fire service network functions both as a means of fire prevention, by allowing wetting down of coal faces on days of high fire risk and of fire response, by providing a supply of water for firefighting hoses, filling tankers and fixed sprays during firefighting.

Water supply requirements for the fire service network are documented in the Mine Fire Service Policy and Code of Practice. For actively mined areas and conveying corridors, the Policy prescribes a number of minimum coverage requirements.[65] However, for worked out areas of the mine, the minimum requirement is that:

> Tanker filling points are to be provided such that a tanker on any part of the worked out batters is within 5 minutes travel of a tanker filling point. Note: in the absence of tanker filling points a hydrant manifold will suffice.[66]

The difference in treatment between actively mined and worked out areas of the mine is consistent with the overall aim of the Mine Fire Service Policy and Code of Practice 'to prevent or extinguish any fire which may threaten the brown coal winning activities, and to restore normal operating conditions as early as possible after a fire.'[67]

The Board heard evidence that during the period from around 1994 until around 2007, degraded or leaking pipework was progressively removed from worked out areas of the Hazelwood mine,[68] principally in the area of the northern batters.[69] This section was significantly affected by the Hazelwood mine fire in 2014. During the Hazelwood mine fire, extensive pipework was re-installed in this area in order to assist with the fire suppression effort.[70]

The adequacy and effectiveness of the fire service network, including examination into the removal of pipework, is explored in detail in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

POWER SUPPLY

The fire service network depends on a reliable power supply in order to operate the electric pumping stations and provide pressure to the system. While the fire service network can still operate without electricity, it relies on a gravity feed and results in greatly reduced water pressure.[71]

The Hazelwood mine is powered by a series of substations that work from mains power from the external power grid supplied by SP AusNet, including:

- Morwell North (MWN), a substation on the northern side of the batters, which is the primary source of power for the mine. This substation is fed by two 66kV power lines intended to provide a level of redundancy, ie there is a backup if one of the lines goes down.
- Morwell West (MWW), a further substation located on the southern batters also fed by two 66kV power lines.
- Morwell East (MWE), a smaller 11kV power feed running off a separate circuit, situated near Energy Brix.
- MHO, a smaller substation feed.[72]

GDF Suez submitted that the two major power pump stations for the fire service network, being the dirty water pump station and the clean water pump station, are supplied from substations MWN and MWW.[73]

As explained in Chapter 2.3 Fighting the Hazelwood mine fire, power to the two major pumping stations was lost as a result of fire damage to the two SP AusNet 66kV power lines that run parallel across the northern batters. Loss of power also resulted in an interruption to coal production, and the Emergency Command Centre was left in darkness and staff were unable to use equipment such as CCTV monitors, computers and printers.[74]

Section 4.5.1 of the Mine Fire Service Policy and Code of Practice specifies a number of design requirements for the power supply at the Hazelwood mine:

> Duplication of the electrical supply, geographic separation of feeders and automatic switching is to be provided so as to achieve the required level of reliability for Hazelwood Mine plant and equipment. Where practicable, ensure that duplicate electrical supplies are provided from separate power distribution centres. Automatic fault isolation facilities shall be provided for all plant connections on feeders supplying fire service pumps. Where practicable, the electrical distribution system should be flexible enough to supply major items of plant from alternate feeders.[75]

A number of other requirements are prescribed by the Mine Fire Service Policy and Code of Practice, including:

- Section 4.5.2 states that power should preferably be supplied by overhead lines and specifies detailed requirements for routing of lines and cables.
- Section 4.5.3 provides that power poles situated on coal must be protected by a three metre radius area of compacted sand or clay with a minimum depth of 75 millimetres. For timber poles other than on coal, a three metre radius area must be kept clear of combustible material. For concrete poles, no such requirement applies.
- Section 4.5.4 specifies detailed requirements for siting of cabling, including a requirement to ensure cables running down batters are run in concrete troughing boxes.[76]

The SP AusNet power poles for the 66kV power lines to the MWN and MWW substations were made of timber, not concrete.[77]

Independent expert, Mr Roderic Incoll, Bushfire Risk Consultant, considered it appropriate to replace timber poles with concrete poles as a means of allowing greater redundancy in power supply.[78] However, he noted that concrete poles would not necessarily eliminate the risk of power loss during a fire, as power could be lost for a variety of reasons, such as damage to transformers. In Mr Incoll's opinion, the critical issue was the routing of power lines which, in the case of the Hazelwood mine, run across a potential fire path. Mr Incoll suggested it was preferable to route the power supply from the south or south-east of the mine, where a fire was less likely.[79]

At the time of the Hazelwood mine fire, there were no internal back-up power supply generators at the Hazelwood mine.[80]

The Hazelwood mine fire was not the first occasion during which the water supply for firefighting was severely impacted by a loss of power to pumps 50 and 53. During a fire that occurred on 12 October 2006, a loss of power supply to the pumps 50 and 53 caused the pumps to cease working. As a result, the water level dropped causing water pressure loss for firefighting and subsequently a severe reduction of water supply.[81]

An Incident Investigation Report into the October 2006 fire prepared by GHD Consulting Pty Ltd (GHD) in January 2007 noted that 'a back up system for crucial services within the Mine Fire Service Network is not available.'[82]

In January 2008, GDF Suez conducted an internal review to follow up on the implementation of recommendations arising from the review into the October 2006 fire. In that internal review, it was also observed that there was no backup electricity supply for the Emergency Command Centre other than the mains power supply. An additional recommendation was made that: 'The team managing the development of the emergency response control room at the training centre, should investigate the need for generators to supply power in the event that electricity supply is unavailable at the time of an emergency.'[83]

A further internal audit was conducted in March 2008 to follow up on implementation of recommendations arising from the October 2006 fire. The audit noted that the January 2008 review made a further recommendation 'to perform a cost/benefit analysis to determine whether the Incident Control Centre required back-up generators to provide for the event that external power was not available during an emergency.'[84] However, the report from this internal audit does not record whether this cost/benefit analysis was ever undertaken.

In June 2012, Mr Stan Kemsley, GDF Suez Mine Technical Compliance Manager, conducted an audit of the implementation of recommendations from a number of past fires at the mine, including the October 2006 fire. Mr Kemsley's report, dated 29 June 2012, includes a table, which lists the recommendations from each incident and states whether they have been addressed and whether they have, in Mr Kemsley's view, been effective. The audit found that all relevant recommendations from the original GHD report into the October 2006 fire had been implemented.[85]

However, Mr Kemsley's audit did not enquire into the implementation of recommendations made as a result of the earlier internal audits conducted in January and March 2008. Because the recommendation to conduct a cost/benefit analysis into a back-up generator for the Emergency Command Centre was from a subsequent internal audit, it is unclear from the Kemsley audit whether the cost/benefit analysis was ever carried out.

COMMUNICATIONS

Section 7.5 of the Mine Fire Service Policy and Code of Practice provides that:

> A fully equipped multi-channel communication system is to be provided in the Emergency Command Centre at the Hazelwood Mine, capable of being manned by additional operators during fire emergencies. Provision is also to be made to enable the CFA Incident Controller to use the Fire Service Office or the Emergency Command Centre as a control centre in the event of an emergency situation.
>
> All Fire and Emergency calls are to be called to the Mine Control Centre…or by using the radio/emergency button on hand held radios. The Mine Control Centre is available for contact all hours.
>
> Fire spotter stations are to be available either dedicated or for emergency use for fire spotting purposes and provided with an adequate means of communication.
>
> The Fire Service Office may be strategically positioned to also fulfil the role of a fire spotter station. Fire spotter stations are to be located such that an adequate view of the whole of the Hazelwood Mine is available under various wind conditions.[86]

Under the Mine Fire Instructions, the Director of Mining, the Production Manager, or the Mine Production Superintendent declares a 'Fire Alert' when hot, dry or windy conditions are expected and there is a high risk of fire rapidly spreading in the mine.[87] When a 'Fire Alert' has been declared, s. 6.1 of the Mine Fire Instructions provides that the following communication procedure must be initiated to warn all personnel entering or working near the Hazelwood mine:

- A prepared radio message is broadcast on Hazelwood mine radio frequencies informing personnel of action required.
- Flashing red lights are activated on all Dredgers and TS2 and at the Control Centre, Fire Service Office and No 3 Transfer House.
- The Fire Alert button is activated on the mine's systems control software system, which enacts an SMS alert to designated staff and alerts those using that system.
- The Director of Mining, the Mine Production Superintendent or the 1x7 crew services team leader must inform other officers that a Fire Alert has been implemented.
- When fire danger has passed, a prepared radio message broadcast from the Hazelwood mine radio frequencies informs all personnel that the Fire Alert has been formally cancelled. The flashing red lights, mentioned above, will be turned off.[88]

The Mine Fire Instructions also prescribe a detailed communications protocol for reporting fires. All fires in the mine area must be reported by telephone to the Mine Emergency Command Centre, or by using the radio/emergency button. Fires must be reported to the CFA via 000 on days of declared Total Fire Bans for the Victorian Eastern Total Fire Ban District, or at any time that the Hazelwood mine has declared a Fire Alert. CFA assistance must also be requested immediately when suppression of a fire is beyond the capability of the mine fire crews in attendance, or the initial response has exceeded 30 minutes.[89]

The Emergency Response Plan sets out a detailed list of telephone numbers for all emergency contacts, outside agencies, and GDF Suez personnel in emergency roles. A specific radio repeater channel has been set up for communications in an emergency situation. The Emergency Response Plan provides instructions for its use.[90]

GDF SUEZ FIREFIGHTING PLANT AND EQUIPMENT

Figure 2.20 describes the firefighting infrastructure, plant and equipment available at the Hazelwood mine.

Figure 2.20 GDF Suez firefighting plant and equipment[91]

Firefighting infrastructure, plant and equipment	Description
3,000 litre tankers	One of the ex-CFA tankers is operated by a security and emergency services contractor (Diamond Protection Pty Ltd).
Two 30,000 litre water tankers	These are owned by contractors (Delta Rent Pty Ltd).
Furphy carts	Three 1,000 litre furphy carts and one 2,500 litre furphy cart. A furphy cart is a water-carrying trailer with hoses and pumps, which can be towed.
Two booster pump trailers	The trailers are used in conjunction with crane monitors (spray attachments to crane arms).
Crane monitors	Crane monitors can be attached to the mine's all-terrain cranes. The Hazelwood mine has three crane monitors.
Four wheel drive vehicles	All four wheel drive vehicles operating in the mine have two 30 metre hoses, nozzles and a 16 litre knapsack. These hoses can be attached to the fire service network, which allows all mine employees and contractors with the vehicles to respond to a fire.

GDF SUEZ FIREFIGHTING PERSONNEL AND TRAINING

The Emergency Response Plan lists the personnel experienced and trained for each role within the emergency organisation structure.[92]

The GDF Suez fire service crew, who are available to suppress fire at the Hazelwood mine, are able to call upon the following resources:

- The 1x7 crew. This includes two crews, 1x7A and 1x7B, who undertake general maintenance of the fire service network, minor maintenance of mine infrastructure, support the 2x12 crew and respond to fire.[93] Each of the two crews includes eight to 11 personnel.[94]
- The 2x12 crew, consisting of two crews of approximately 18–20 mine operations personnel.[95]
- RTL Mining and Earthworks Pty Ltd and O&M Pty Ltd, which provide skilled labour under contract, including mechanics, boilermakers and plant drivers. One to two personnel from the RTL Mining crew man each of the 30,000 litre tankers.[96]
- Belle Banne, which provides maintenance services under contract for mine plant and equipment for the conveyor belt system.
- Diamond Protection, which provides security, first-aid service and back-up fire response services at the mine.[97]

The Mine Fire Service Policy and Code of Practice emphasises the importance of training in firefighting methods and procedures to prepare for combating fires. The Mine Fire Service Policy and Code of Practice provides for adequate training sessions and exercises to ensure that each employee understands the appropriate techniques and procedures for fighting brown coal fires, and undergoes refresher training sessions at regular intervals.[98]

Under the Mine Fire Service Policy and Code of Practice, training of all Hazelwood mine personnel and relevant contractors must be carried out by the beginning of the declared fire season.[99] According to Mr Dugan, all GDF Suez personnel and contractors receive basic training in brown coal firefighting, and refresher training for each person typically occurs every 12 months.[100]

The Emergency Response Plan envisages that personnel will receive training according to the skills and knowledge required for emergency duties assigned to them. Training needs that may be identified include:

- 'Australian Inter agency Incident Management' for all Emergency commanders and Emergency Service Liaison Officers
- Emergency Commanders, Logistics Officers and Planning Officers are to brief their subordinates at least annually
- Emergency exercises are considered to be the main training for emergency personnel – these are simulated emergency exercises that may include joint exercises with emergency service agencies. At least one exercise will be held annually.[101]

GDF Suez uses several training tools. GDF Suez provided the Board with the following training documents:

- Fire Person Duties Training Manual (issued 23 August 2012), which includes comprehensive information on emergency procedures, characteristics of brown coal fires, firefighting equipment and suppression methods[102]
- Mine Fireman Assessment (issued 24 February 2012), which is used to record whether training has been completed and to assess personnel after receiving training.[103]

GDF Suez also utilises a training video titled 'Brown Coal Firefighter Awareness'. This video was produced by the CFA and developed jointly by the region 10 CFA and Latrobe Valley coal mine operators.[104]

According to Mr Dugan, GDF Suez also conducts simulated fire preparedness exercises for all Hazelwood mine employees and contractors. These exercises may involve other agencies, such as the local CFA brigades, to familiarise them with the mine and suppression methods for brown coal fires. Mr Dugan also explained that the exercises are an opportunity to practise the procedures set out in the Emergency Response Plan, and allow the 2x12 shift supervisors to be prepared to act in the role of Emergency Commander in the event of an emergency.[105]

According to Mr Dugan, GDF Suez conducted four simulated fire emergencies during 2013 and one in January 2014, all of which involved the CFA. A further simulated fire emergency with the CFA and other agencies had been scheduled for March 2014, but this was postponed due to the Hazelwood mine fire.[106] One of these simulations, on 11 December 2013, involved a simulated fire on a batter.[107]

According to Mr Craig Lapsley, Fire Services Commissioner, professional and volunteer firefighters from the CFA also have a responsibility to work with the coal mines to improve planning and response to major fires in the mines. As noted above, training and joint exercises with GDF Suez are a part of the fire preparedness standard operating procedures for the Yallourn North, Morwell and Traralgon fire brigades and must be conducted under r. 5.3.34 of the OHS regulations. Since 2006, the CFA and GDF Suez have held regular meetings and joint training sessions. An annual training event is held at the Hazelwood mine for GDF Suez personnel, contractors and local brigades. In addition, local brigades regularly conduct site visits for inductions and for the purpose of relationship building. A number of CFA volunteers are employed at the mine and therefore have operational knowledge of firefighting at the mine.[108]

ROUTINE AUDITING OF LEVEL OF PREPAREDNESS

Section 7.9 of the Mine Fire Service Policy and Code of Practice requires that prior to the start of the declared fire season, an annual audit of firefighting equipment using the 'Check List For Fire Fighting Equipment Annual Audit Inspection' occurs.[109]

Under the 'Check List For Season Specific Fire Preparedness and Mitigation Planning' (issued 24 November 2008), the fire season is generally declared on 1 November each year, but can be declared earlier or later depending on how rainfall, relative humidity and maximum temperatures for that year have tracked against monthly averages.[110]

The 'Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning' (issued 13 September 2007) requires the audit to be conducted in two phases:

- a preliminary audit in July to identify the equipment that is available, ready and fit for purpose
- after any necessary corrective action identified in the preliminary audit is completed, a final audit in September each year to ensure that all firefighting equipment is available, ready, working and tested prior to being needed for the purpose of firefighting.[111]

The 'Check List for Fire Fighting Equipment Annual Inspection' (issued on 18 January 2013) is comprehensive and covers plant and equipment throughout the mine, including the Emergency Command Centre, communications equipment, vehicle fire suppression packs, emergency access routes and signage, alert lighting, pumping stations, pumps, valves, pipelines, fixed sprays, hydrants, tanks, fire service tankers, fire service trailers, portable sprays, hoses, nozzles and monitors.[112]

Mr Dugan explained that throughout the year he produces a 'rag report' for senior management at the start of each week summarising the status of fire and flood preparedness at the Hazelwood mine. 'Rag' refers to red, amber, green as in traffic light colouring system. The rag report covers the status of the pumps for the reticulated fire services water system, the status of the annual firefighting audit, whether required grass slashing has been completed, and the extent to which the mine employees and contractors have undertaken their yearly training. The rag report also includes weather forecast information and uses the traffic light colouring system to indicate the level of fire and flood risk in the upcoming week.[113]

According to Mr Steven Harkins, GDF Suez Director of People, Culture and Environment, these rag reports help the senior management team keep track of fire preparedness measures and the level of resources being allocated to managing fire related risks.[114]

According to the rag report prepared by Mr Dugan on 3 February 2014:

- The annual audit of firefighting equipment and 90 per cent of follow up action items were complete.
- All employees' fire training was up to date.
- All firefighting equipment and infrastructure had been checked and was generally ready for use.
- All grass slashing was complete but a second cut may be needed in late February.
- Under the heading 'fire related issues to be managed in the next week', the weather forecast for the next seven days was noted as 'Temperatures of 39 deg. Monday with a TFB [Total Fire Ban]. Tending to mid–20s mid-week before returning to high 30s later in the week.'
- All items were assigned a green traffic light (ie 'acceptable'), with the exception of the weather forecast, which was assigned an amber light (ie 'item of concern').[115]

Mr William Brown, former Fire Services Officer at the Hazelwood mine, stated that prior to privatisation the State Electricity Commission Victoria sent a mechanical engineering expert from Monash House to conduct an annual audit of the mine's practices and to ensure the mine was adhering to the Mine Fire Service Policy and Code of Practice (as it then existed). According to Mr Brown, these external audits were very thorough. Following privatisation, external audits ceased and were instead conducted in-house, but Mr Brown sought to ensure that they were carried out to the same rigorous standard.[116]

EMERGENCY RESPONSE PLANNING

The 'Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning' (issued 13 September 2007) requires that on days of high fire alert, a Period Specific Fire Preparedness and Mitigation Plan must be prepared and communicated to all personnel. A high fire alert warning is triggered when any one of these criteria is met:

- wind gusts above 40 kilometres per hour
- a forest or grassland fire danger index over 40
- relative humidity below 25 per cent
- maximum temperatures above 35^{0}C
- maximum wind speeds above 30 kilometres per hour.[117]

The Period Specific Fire Preparedness and Mitigation Plan sets out the forecast weather for the day concerned, the positions of the dredgers in relation to the conveyors, the required fire preparedness steps (including spraying, and filling of furphies and other water tankers), the resources available (including employees and contractors), and reiteration of requirements upon a Fire Alert being notified.[118]

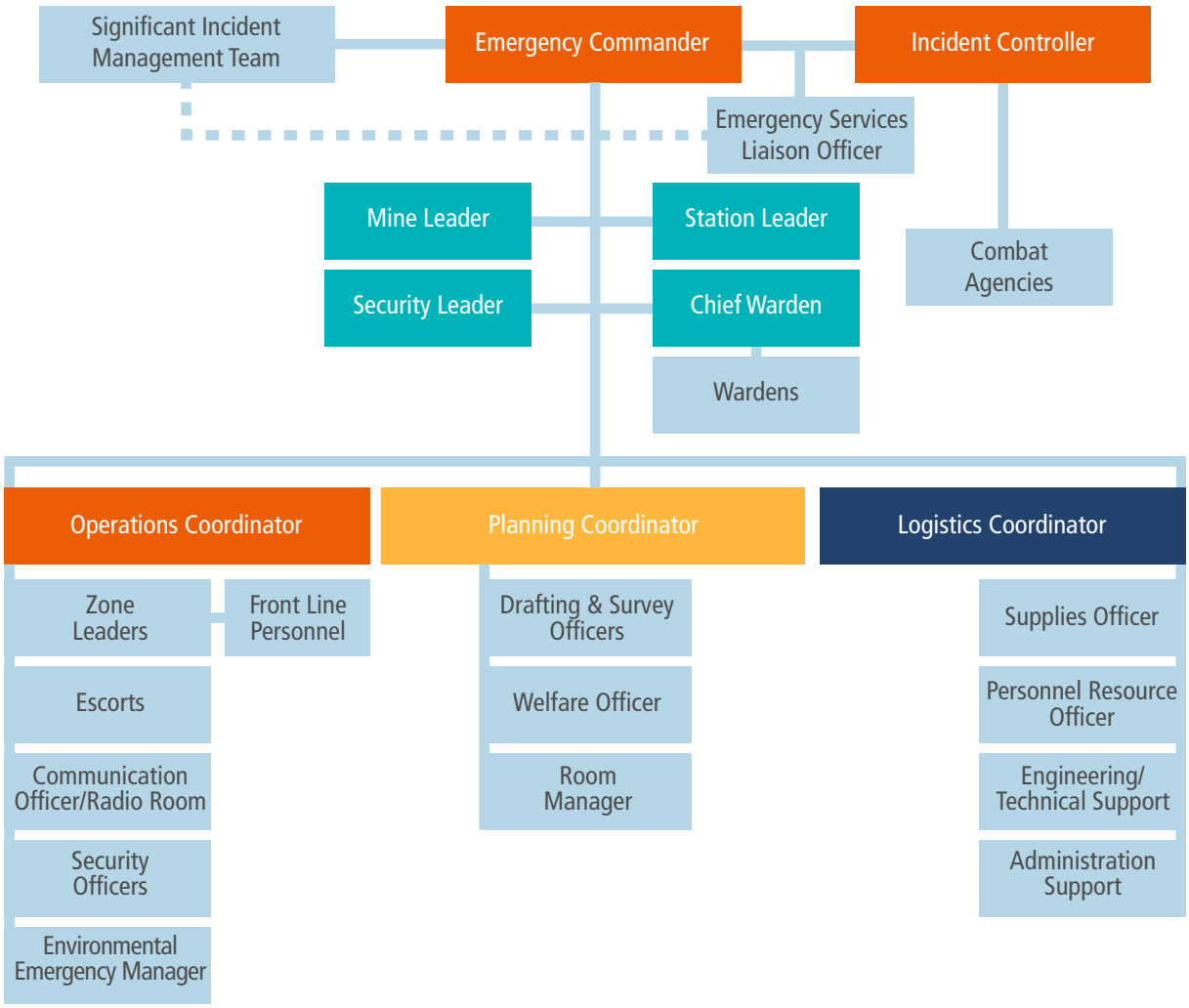
According to Mr Dugan, this Period Specific Fire Preparedness and Mitigation Plan may be issued by the services superintendent, a 1x7 services supervisor, or by the Mine Production Manager, and is sent to all employees and contractors by email, with persons who do not have computer access to be contacted by their supervisors.[119]

If there is a 'major outbreak of fire', this triggers the procedures under the Emergency Response Plan.[120] Under this scenario, s. 7.4 of the Emergency Response Plan requires that a fire alert is declared and that procedures in the Mine Fire Instructions are carried out.[121]

Under s. 2.9 of the Emergency Response Plan, if the emergency is, or has the potential to escalate to a serious, large, or complex incident, a 'full-blown emergency' response must be initiated immediately. A 'full-blown emergency' may be declared by the mining shift supervisor or by GDF Suez senior managers, following which that person steps into the role of Emergency Commander. The Emergency Commander must then set up the Emergency Command Centre and await the arrival of the Incident Controller from the responsible combat agency. The Emergency Commander hands over control of the emergency to the Incident Controller once the Incident Controller arrives, but provides continued assistance and supervision of internal resources at the Hazelwood mine.[122]

The declaration of a 'full-blown emergency' also triggers employees to take up their roles within the emergency organisation structure depicted in Figure 2.21. The emergency organisation structure operates in parallel to the normal operational structure of the business until the crisis has concluded.

Figure 2.21 Emergency organisation structure under the GDF Suez Emergency Response Plan[123]



The Emergency Response Plan describes the roles and responsibilities of the positions depicted in Figure 2.21 including:[124]

- Emergency Commander: The senior Hazelwood Mine Manager/Supervisor/Officer who may take control of GDF Suez resources if and when a major emergency exists. The Emergency Commander reports to the Incident Controller about the management of response activities.

  The functions of the Emergency Commander include establishing the Emergency Command Centre, nominating site access, requesting personnel to fill roles of Operations Coordinator, Logistics Coordinator and Planning Coordinator, requesting the Emergency Services Liaison Officer to attend and liaise with external agencies, and assisting the Incident Controller with various functions.

- Incident Controller: The senior officer of an external agency (the CFA in the event of fire), who may take control of an emergency involving the Hazelwood mine.

- Emergency Services Liaison Officer (ESLO): This position is in place on a roster basis. During an emergency the ESLO is responsible for liaising with emergency services about the status of the incident and arranging for emergency personnel to promptly attend the incident at the mine or power station.[125]
- Operations Coordinator: This role directs and controls field operations, ensures access to the work site is restricted but maintained for emergency response, and communicates the emergency status to personnel. The following positions report to the Operations Coordinator:
  - Zone Leader: manages front line firefighting personnel for a given location within the mine. In the case of a fire emergency, each coal level may be treated as a fire zone
  - Escort: guides teams around the mine during an emergency
  - Communications Coordinator: manages radio, phone, fax communications.
- Planning Coordinator: This role involves obtaining maps and plans of the Hazelwood mine, and collecting and analysing incident information, including predictions, to inform the Logistics Coordinator of additional resource requirements, and to maintain a register recording the location and task of resources deployed.
- Logistics Coordinator: This role provides logistics coordination to combat the emergency. The Logistics Coordinator manages the vehicles pool, and establishes the materials-issuing centre, medical room canteen and rest area. The role manages stocks, services and materials to combat an incident, and plans resourcing, including shifts to roster personnel on duty.
- Mine/Station Leader: This role provides technical and administrative guidance to the Emergency Commander, and directs and oversees the Operations Coordinator, Planning Coordinator and the Logistics Coordinator.[126]

IMPLEMENTATION OF FIRE PLANNING BY THE STATE

EMERGENCY MANAGEMENT IN FEBRUARY 2014

As explained in Chapter 2.1 Origin and circumstances of the Hazelwood mine fire, the worst fire conditions since Black Saturday were predicted on the weekend of 8 and 9 February 2014. There were multiple fires already going across the State of Victoria. Planning for the fire risks took place at state, regional and incident levels.

Prior to and during the Hazelwood mine fire, Mr Lapsley assumed the role of State Controller working from the State Control Centre in Melbourne.[127] On or about 6 February 2014, Mr Lapsley appointed two Deputy State Controllers to assist in the management of metropolitan and rural fires in Victoria.[128]

The State Emergency Management Team met daily or twice daily from 6 February 2014 until 20 February 2014 and then every three days until 24 March 2014.[129] The State Control Team, comprising the chief officers of fire agencies, the Chief Health Officer, the Victoria Police State Emergency Response Officer, and the Director of Emergency Management Health and Human Services, met daily in the weeks leading up to the weekend of 8 and 9 February 2014.[130]

The State Control Centre was operating at the highest level of readiness.[131] It regularly produced various planning documents and reports including Fire Weather Briefings, State Operational Briefs and State Situation Reports.[132]

All eight regional control centres, including the Traralgon Regional Control Centre, were established or progressively established according to local conditions. The Traralgon Regional Controller for day shifts on 7 to 9 February 2014 was Mr Bryan Russell.[133]

Of the 38 Incident Control Centres around Victoria, 34 Incident Control Centres were either operating or would be established because of state-wide fire conditions.[134] Around 8 pm on 7 February 2014, the Traralgon Incident Control Centre was established as a Level 3 Incident Control Centre. It was not staffed overnight. Mr Jeremiah was appointed as Incident Controller for the day shifts from 8 to 12 February

2014.[135] Mr Jeremiah is an extremely experienced Incident Controller, having been operating at the highest level of accreditation (Level 3) for approximately 25 years.[136]

The Traralgon Incident Control Centre was staffed pursuant to Standard Operating Procedure J2.03 and was supported by an Air Operations Manager and Air Base Manager based in the Traralgon Regional Control Centre. Mr Jeremiah indicated that the Traralgon Incident Control Centre would usually be staffed with more personnel but resources were in high demand.[137] Contrary to Standard Operating Procedure J2.03, no base Incident Management Teams were set up in Ellinbank, Yarram, Noojee and Erica. Mr Jeremiah explained that as resources were stretched only Leongatha had a base Incident Management Team in place that weekend. As a consequence, the Traralgon Incident Control Centre was managing a much larger area during the period 7 to 9 February 2014.[138]

Mr Lapsley informed the Board that decisions were made at both regional and state levels that several Incident Management Teams would not be established on the weekend of 8 and 9 February 2014. Mr Lapsley indicated that workarounds were put in place which involved the Traralgon Incident Control Centre taking control over the greater area.[139]

From 8 February 2014, Mr Jeremiah was the Incident Controller acting as Chair of the Incident Emergency Management Team, whose members included the CGEIG and Hancock Victorian Plantations Pty Ltd.[140]

RESOURCING FOR FIRE RESPONSE IN FEBRUARY 2014

CFA firefighting resources were ready and on alert state-wide during February 2014. In the Latrobe Valley, DEPI resources were at lower levels of availability because of demands for firefighting at existing fires, particularly in East Gippsland. Cross-agency arrangements were in place so that the MFB could backfill CFA stations after the CFA were called out to a fire. In addition, 119 interstate and international firefighters and incident management personnel had been called in to assist with the fire response.[141]

Additional aircraft were made ready to supplement Victoria's 42 aircraft, bringing the number of available aircraft to 54. Nine helicopters and five water bombers, plus six aircraft provided by New South Wales were being used to suppress fires in the Gippsand area. Aerial surveying was also occurring with additional aircraft.[142]

PLANNING FOR AND RESPONDING TO THE HERNES OAK–MCDONALD'S TRACK FIRE

On 7 February 2014, the CFA responded to the Hernes Oak–McDonald's Track fire with five local brigades, an additional six tankers and two aircraft. The fire was managed from the Local Control Facility at Churchill.[143]

On 8 February 2014, the Hernes Oak–McDonald's Track fire was divided into two sectors, the south-west area of the fire and the north-east end of the fire on the opposite side of the Princes Freeway. One division commander and two sector commanders were at the fireground. Local CFA resources were deployed to the two sectors.[144]

Over the course of the day, the Traralgon Regional Controller and the Traralgon Incident Controller actively managed the situation around them by regular meetings and telephone conferences within their own teams, with each other and with the State Control Centre.[145]

During the day, the State Control Centre produced multiple Phoenix Rapidfire models, which made predictions about the likely spread of the Hernes Oak–McDonald's Track fire. The first series of models were for the spread of the fire on 8 February 2014. Mr Jeremiah assessed that the likelihood of the Hernes Oak–McDonald's Track fire breaking its containment lines on 8 February 2014 was low, but if it did, the consequences would be high to catastrophic because of its proximity to the Latrobe Valley mines, Princes Freeway, the Gippsland railway and the township of Morwell.[146]

At some time during the afternoon, Mr Jeremiah and his team briefed the CGEIG on the potential bushfire threat associated with the Hernes Oak–McDonald's Track fire to local essential industry operators, including the Hazelwood mine. Mr Jeremiah gave evidence to the Board that his team provided copies of Phoenix Rapidfire models showing the potential spread of the fire into the Hazelwood mine to the Chair of the CGEIG.[147]

A further Phoenix Rapidfire model was sent to the Chair of CGEIG by email at 4.24 pm on 8 February 2014.[148] This model appeared to be a prediction of fire spreading overnight on 9 February 2014. This model was then forwarded to GDF Suez, as discussed later in this Chapter.

Based on his past experience, Mr Jeremiah expected that this information would be passed on to CGEIG members, and in particular 'that those entities needed to take this threat seriously.'[149]

At around 4 pm, Mr Jeremiah requested additional resources from the Regional Controller to be pre-positioned in the Latrobe Valley, namely three strike teams and two heavy helicopters.[150] Two strike teams were made available on Saturday evening 8 February 2014 and two helicopters were deployed and arrived by midday on Sunday 9 February 2014.[151] Mr Lapsley gave evidence that the reason the aircraft were not sent earlier, in accordance with Mr Jeremiah's request, was because the Victorian fleet had to be reshuffled to make sure that Mr Jeremiah got what he needed.[152]

At some time later in the day but before 6 pm on 8 February 2014, Mr Jeremiah was provided with additional Phoenix Rapidfire modelling, which showed the Hernes Oak–McDonald's Track fire potentially spreading during the early hours of Sunday morning 9 February 2014 into a community south-west of Hernes Oak. Other Phoenix Rapidfire models produced documented the likely spread of the Hernes Oak–McDonald's Track fire at various times on 9 February 2014, assuming a break in the containment lines.[153]

Mr Jeremiah attached two of the Phoenix Rapidfire models to his witness statement, which showed the fire spread at 9 am and 11 am on 9 February 2014. Mr Jeremiah explained that the time refers to the commencement of the fire spread and the image captures the fire spread over a two-hour period.[154] These models did not reach GDF Suez personnel. It is unclear from the evidence why this did not occur.

Around 6 pm on 8 February 2014, Mr Jeremiah recommended the evacuation of approximately 300 residents in the Hernes Oak, Coalville and Driffield areas west of the Strzelecki Highway, based on his assessment of risks if the fire escaped containment lines in a way simulated by the Phoenix Rapidfire models. The evacuation was coordinated by the Traralgon Incident Control Centre and successfully carried out by Victoria Police and the SES.[155]

On 9 February 2014, the State Control Centre issued a briefing indicating that there were hotspots in the south-east corner of the Hernes Oak fire, that there was potential for the fire to impact on two open cut mines and that it was drawing up an evacuation plan for Morwell.[156] The briefing was given to the Traralgon Incident Control Centre.

On 9 February 2014, the containment and patrolling of the Hernes Oak–McDonald's Track fire continued.[157] Two strike teams were working on the fire[158] and four aircraft were allocated to the fire.[159] Existing roads and waterways were providing natural barriers to fire spread.[160]

At approximately 10.15 am on 9 February 2014, a fire started near Jack River. Jack River is approximately 45 kilometres south-east of Morwell.[161] This fire posed an immediate threat to life and property near Yarram. Due to the resourcing issues discussed above, Mr Jeremiah was designated the Incident Controller for this fire. As the Hernes Oak–McDonald's Track fire was contained, Mr Jeremiah prioritised the Jack River fire and diverted some of the aircraft pre-positioned to fight the Hernes Oak–McDonald's Track fire to form part of the eight aircraft dispatched to fight the Jack River fire.[162] The Jack River fire spread to cover about 1,800 hectares by the end of the day,[163] and eventually covered approximately 2,900 hectares.[164]

At approximately 1.15 pm on 9 February 2014, the Hernes Oak–McDonald's Track fire broke containment lines on the north-eastern corner, near the Princes Freeway. The two CFA strike teams were not able to stop the fire. Mr Jeremiah stated:

> It was moving so quickly alongside and between the railway line and Princes highway [sic] that it was unsafe to directly attack the head of the fire. At this stage, my focus was on protecting the fire crews on the ground and protecting the people of Morwell, who were directly in the line of, and being impacted by the Hernes Oak–McDonald's Track fire....[165]

Mr Jeremiah gave evidence to the Board that according to the State Controller's Strategic Priorities it was also a priority to protect the Australian Paper Manufacturers Maryvale pulp mill, the Maryvale Private Hospital, the Gippsland Water Factory and the Yallourn and Hazelwood power stations.[166] Due to the pace of the fire, Mr Jeremiah did not have time to order an evacuation of the township of Morwell.[167]

Whilst Mr Jeremiah gave evidence that he was not in a position to order an evacuation on the afternoon of 9 February 2014, Mr Lance King, Coordinator of Emergency Management at Latrobe City Council, together with Senior Sergeant Peter Fuzinato of Victoria Police, directed the evacuation of residents from the western border of Morwell. Mr Jeremiah had contacted Mr King before the Hernes Oak–McDonald's Track fire had broken its containment lines, and asked him to prepare an evacuation plan with Senior Sergeant Fuzinato. As that plan was in place at the time that the fire broke containment lines, Mr King and Senior Sergeant Fuzinato were able to carry out the evacuation successfully.[168]

Shortly before 4 pm on 9 February 2014, a State Emergency Warning System warning was issued for Morwell.[169]

From 5.30 pm on 9 February 2014, Mr Steven Warrington, a Deputy Chief Officer with the CFA, was appointed as Deputy Regional Controller (later known as Regional Controller (Mines)). Mr Warrington explained that the role of Regional Controller (Mines) was created specifically for the purpose of providing an additional layer of incident management expertise and resources in relation to the mine fire and the fire threats that existed at Yallourn and Maryvale.[170]

IMPLEMENTATION OF FIRE PLANNING BY GDF SUEZ

FIRE PREPARATION PLANNING

Given the conditions forecast, and the declaration of a total fire ban for the weekend of 8 and 9 February 2014, at 11.36 am on 7 February 2014, GDF Suez issued a Safety Blimp message to all staff noting that mine operations would be restricted, including prohibiting any hot works within the mine (for example, welding and grinding).[171]

At 12.50 pm on 7 February 2014, GDF Suez issued a Hazelwood Mine Fire Preparedness and Mitigation Plan (Fire Preparedness and Mitigation Plan) for each of 8 and 9 February 2014. The Fire Preparedness and Mitigation Plans indicate that at the time of their issue, there were no externally sourced fires near the mine.[172]

The Fire Preparedness and Mitigation Plans called for certain fire prevention measures to be implemented from the commencement of the 7 am shift each day, including:

- all personnel on high alert
- fully hosing up all unmanned machines
- checking all pumps and the east header spears
- relocating portable sprays if necessary
- turning sprays on intermittently
- conducting patrols
- having fire tankers filled and on standby.[173]

The Fire Preparedness and Mitigation Plans did not record any action for wetting down areas within the mine that were not covered by the reticulated fire services water system, with the possible exception of portable sprays. Mr David Shanahan, GDF Suez Services Superintendent, told the Board that the general practice for fire protection was to only wet down the operational levels of the mine as they were the areas that contained mine assets. The northern batters, containing highly combustible coal, were not protected by the application of water either by sprays or some other method, because of the absence of critical assets in these areas. Mr Shanahan noted that the clay covering of the levels in the northern batters offered some fire protection but the batters were exposed to the risk of fire.[174]

Mr Alan Roach, GDF Suez Security and Emergency Services Manager, was the ESLO rostered on for the weekend of 8 and 9 February 2014. Mr Ian Wilkinson, GDF Suez 2x12 Mine Shift Supervisor, was also rostered on for that weekend. Mr Wilkinson was the only person rostered on that day who could fill the role of Emergency Commander in the event of a fire in the mine. There were no formal standby arrangements in place for senior management to fill the Emergency Organisation structure at the mine if fire did break out over the weekend. The other persons listed as Emergency Commanders were planning to and did leave Morwell for the weekend, along with other senior mine managers who were not rostered on.[175] Mr Garry Wilkinson, GDF Suez Mine Director, was on leave in Queensland.[176] Mr James Faithful, GDF Suez Technical Services Manager – Mine and Acting Mine Director, was in Inverloch.[177] Mr Dugan was in Mallacoota.[178] Mr Kemsley was not on site.[179]

Mr Harkins gave evidence to the Board that he did not turn his mind to whether it was desirable for the Mine Manager or Acting Mine Manager to be on site on Saturday and Sunday in light of the extreme fire risk.[180]

By 4.45 pm on 7 February 2014, GDF Suez personnel were aware of the Hernes Oak–McDonald's Track fire.[181] Notwithstanding the new outbreak of fire in close proximity to the mine, the Fire Preparedness and Mitigation Plans were not revised or reissued to take into account the changing circumstances.[182]

Mr Harkins spoke with Mr Roach about the Hernes Oak–McDonald's Track fire that afternoon and directed him to obtain a briefing from the mine's security contractors, Diamond Protection, to understand the likely threat facing the mine.[183] There was no evidence from Mr Roach as to whether or not that briefing took place on 7 February 2014. There was no evidence that Mr Harkins spoke with Mr Wilkinson about his readiness to assume the position of Emergency Commander in the event of fire in the mine, given that all other designated Emergency Commanders listed in the Emergency Response Plan would not be on site.

ASSESSMENT OF THE FIRE RISKS ON 8 AND 9 FEBRUARY 2014

Part of Mr Roach's role as ESLO was to keep informed of the fire risks facing the mine.

On 8 and 9 February 2014, Mr Roach monitored the CFA website and received information from the Chair of the CGEIG.

At 4.29 pm on 8 February 2014, the Chair of the CGEIG forwarded an email sent to him by the Incident Control Centre to Mr Roach which attached a Phoenix Rapidfire model provided by the Traralgon Incident Control Centre. The email stated:

> Team
>
> This is latest mapping from the Phoenix model at 01:00 hours tomorrow night worst case scenario this may be the fire protection.[184]

Mr Roach says that he did not understand the Phoenix Rapidfire model.[185] He contacted the Chair of the CGEIG to obtain a better understanding of its meaning. After discussing it with the CGEIG Chair, Mr Roach understood the model to represent the worst-case fire scenario as at 1 am on Monday 10 February 2014. On that basis, he considered he had time to further investigate what the Phoenix Rapidfire model predicted for the following day.[186]

Mr Roach then forwarded the Phoenix Rapidfire model by email to Mr Harkins.[187] In the email to Mr Harkins, Mr Roach articulated his plan to get more information in the morning. He also indicated that he was not intending to share the information with either Mr Dugan or Mr Shanahan. Mr Roach did not send the Phoenix Rapidfire model to other GDF Suez personnel involved more closely with emergency command.[188]

By way of email in response, Mr Harkins indicated that he did not understand the Phoenix Rapidfire model but surmised that it showed the mine's northern batters on fire. Notwithstanding this response, Mr Harkins evidence was to the effect that he thought it was reasonable for Mr Roach not to approach Mr Dugan or Mr Shanahan and to wait for more information the following day.[189] Mr Harkins accepted that he did not have an appreciation of the risk that the mine was facing on the evening of 8 February 2014.[190]

On 9 February 2014 at around 11.30 am, Mr Roach again spoke with the Chair of the CGEIG to obtain an update on information garnered that morning from the Traralgon Incident Control Centre. Having discussed the fire threat the evening prior, Mr Roach's evidence was that he was told that there was no change to the weather forecast and that the wind change was still expected to come through in the afternoon. Mr Roach couldn't recall whether they discussed the Hernes Oak–McDonald's Track fire. Supplemented by his own reviews of the CFA website that day, Mr Roach told the Board he remained comfortable with the mine's fire plans for that day and had no cause to be concerned about the modelling predictions he had received the previous day, notwithstanding that he still did not understand the modelling after discussions with the CGEIG Chair.[191]

There was no evidence before the Board that Mr Roach received any other Phoenix Rapidfire modelling in relation to fire entering the mine earlier than 1 am on Monday 10 February 2014.[192] The Board heard evidence from Mr Jeremiah that multiple Phoenix Rapidfire models had been prepared over the course of 8 and 9 February 2014 and that these had been provided to the CGEIG.[193] There was evidence from Mr Harkins that, had he seen the Phoenix Rapidfire models showing fire escape at 9 am and 11 am on 9 February 2014, he would have reacted differently, notwithstanding his evidence that he did not understand the modelling.[194]

FIRE PROTECTION MEASURES BETWEEN 7–9 FEBRUARY 2014

In the late afternoon on 7 February 2014, GDF Suez personnel undertook additional water spraying and deployed spotting teams following news of the Hernes Oak–McDonald's Track fire.[195] Two graders and two dozers were positioned on the north-western boundary of the mine in anticipation of the threat from the Hernes Oak–McDonald's Track fire.[196]

The shifts commencing at the Hazelwood mine at 7 am on 8 and 9 February 2014 were being managed in accordance with the Fire Preparedness and Mitigation Plan issued on 7 February 2014.[197] Throughout the course of the day, GDF Suez employees wetted down the operational areas of the mine in accordance with the Plan.[198] In addition to the usual rostered staff, two contractors were rostered on for Saturday 8 February 2014 and Sunday 9 February 2014 from 7 am, each responsible for a 30,000 litre water cart to dampen down the coal and respond to any fires if required.[199]

During the morning of 9 February 2014, there were 35 GDF Suez personnel rostered on or on call at the Hazelwood mine, including contractors from RTL Mining and Earthworks Pty Ltd and Diamond Protection.[200] The 1x7 crew were conducting maintenance checks on the fire service network and water sprays.[201]

Around 12.30 pm, Mr Roach arrived at the mine. He visited the mine control centre and discussed the fires in the area and the sprinklers that had been activated.[202] At 12.45 pm, Mr Roach went to the Mine Training Centre to open and clean it up for use in the event of a fire.[203]

Just after 1 pm, Mr Wilkinson informed the 1x7 crew that the Hernes Oak–McDonald's Track fire had flared up, so further preparations began at the mine for the approach of fire.[204] GDF Suez personnel began to patrol the perimeter of the mine above the northern batters and to operate the fire response vehicles.[205] Mr Wilkinson directed GDF Suez personnel to turn on all sprays along 1 level of the northern batters that were not already on, and to patrol the northern batters around 1 level with furphies to look for embers.[206] The Delta water cart (35,000 litre tanker) was also called upon to monitor the mine's perimeter.[207] Additionally, the 1x7 crew installed fire-breaks along the grass level on the western perimeter and in the north-western perimeter of the mine's boundary parallel to the Strzelecki Highway using graders.[208]

At 1.40 pm GDF Suez's security contractor, Diamond Protection, recorded a call to the CFA in its telephone log.[209] The Emergency Services Telecommunications Authority records produced to the Board do not identify any calls reporting fire in the mine.[210] None of the GDF Suez personnel who gave evidence to the Board indicated that they had personally called 000.[211]

At some time between approximately 1.30 pm and 2 pm, Mr Shanahan, Mr Matthew Weddell, GDF Suez Mine Production Superintendent, and Mr Romeo Prezioso, GDF Suez Senior Mine Planner, arrived at the mine, notwithstanding that they were not rostered on that day, due to concerns they each had about the fires nearby.[212]

At around 2 pm, the mine control centre announced a Fire Alert in response to the first mine fire being reported (see Chapter 2.1 Origin and circumstances of the Hazelwood mine fire).[213] At about the same time, the gate to the north of the mine at Depot Drilling Road was opened to enable the CFA to obtain access to the mine if necessary.[214]

At approximately 2 pm, Mr Shanahan observed the Driffield fire and concluded that it was likely to threaten the Hazelwood mine.[215]

DISCUSSION AND CONCLUSIONS

The Board has considered the adequacy and effectiveness of the preparation and planning measures of both the State and GDF Suez in preparing for fire. In doing so, the Board has taken into account the predicted weather conditions for the weekend of 8 and 9 February 2014 and the fire activity in Victoria and the Latrobe Valley at that time (see the discussion in Chapter 2.1 Origin and circumstances of the Hazelwood mine fire).

The discussion and conclusions recorded in this Chapter relate only to the application of the preparation measures prior to the mine fire. The adequacy and effectiveness of the preparation measures as they were implemented during firefighting (for example, power supply) are discussed in Chapter 2.3 Fighting the Hazelwood mine fire.

The Board has identified several areas where preparation and planning were appropriate and in line with policies and regulations. Equally, the Board has identified areas where preparation and planning were deficient.

PREPARATION BY THE STATE

The State was generally well prepared for the extreme fire weather conditions on 9 February 2014.

The Traralgon Incident Control Centre was established with the appropriate team structure and experienced staff. However, due to the extensive fires burning across Victoria, no base Incident Control Centres were set up in Ellinbank, Yarram, Noojee or Erica. Only Leongatha had a base Incident Management Team in place that weekend. The outbreak of the Jack River fire was assigned to the Traralgon Incident Control Centre when it would ordinarily have been managed by the Yarram Incident Control Centre. This put additional pressure on Mr Jeremiah and his team to manage fires outside the Traralgon footprint. The Board notes that the decision that the Yarram Incident Management Team would not be established was approved at State level in accordance with Standard Operating Procedure J2.03.

In addition to the inability to set up the south and west Gippsland cluster with the required readiness levels, the Traralgon Incident Control Centre was further disadvantaged by the slow allocation of the additional aircraft requested by Mr Jeremiah in anticipation of the extreme fire weather conditions on 9 February 2014. The additional aircraft requested on the afternoon of 8 February 2014 did not arrive in the Latrobe Valley until around noon on 9 February 2014 and were not available to suppress the Hernes Oak–McDonald's Track fire during the evening of 8 February 2014 and the morning of 9 February 2014.

The Board accepts the evidence of Mr Lapsley that resources were stretched state-wide. The Board was not sufficiently informed as to whether the additional resources requested by the Traralgon Incident Control Centre could have been allocated any earlier.

PREPARATION BY GDF SUEZ

GDF Suez recognised the need for fire preparedness planning on 7 February 2014 upon the declaration of a Total Fire Ban for the area. However, the Board considers that those preparation measures were inadequate. Instead of planning for the worst, mine management hoped for the best. GDF Suez should have adopted greater preparation measures.

Because GDF Suez is the operator of a brown coal mine in a bushfire prone area, it should have understood the specific vulnerability of the mine site and that the likely consequences of a fire entering the mine would be catastrophic. Accordingly, it should have taken as much action as possible to prepare for, and minimise the risk of, a fire taking hold in the mine. Best practice, not minimum practice was needed. The Board considers that it was not enough for the mine to prepare well—the mine should have prepared extremely well.

The strongest criticism the Board makes of GDF Suez is its failure to undertake a fire risk assessment of the worked out areas of the mine, including a cost/benefit analysis. Not undertaking this risk assessment was contrary to a recommendation made after the fire in the mine in September 2008, which is discussed in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

The Board concludes that there are several other areas where preparation by GDF Suez was inadequate, as described below.

ACCESS TO WATER IN THE WORKED OUT BATTERS

GDF Suez recognised the need for fire preparedness planning on 7 February 2014 upon the declaration of a Total Fire Ban for the area.

The Fire Preparedness and Mitigation Plans issued by GDF Suez addressed the relevant features required by Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning, except that they failed to address the protection of the areas where the reticulated fire services water system was limited (no sprays or sprinklers) or non-existent. The protective measures addressed the critical assets of the mine and not the worked out areas. There were no actions recorded to direct mine personnel to address the flammability risks of the batters. This was a fundamental gap in the preventative measures undertaken by GDF Suez. Further discussion about the effect of limited water in the worked out areas is discussed in Chapter 2.3 Fighting the Hazelwood mine fire.

BACK-UP POWER

The Board is critical of GDF Suez for not having back-up generators available to supplement the mains power supplying the mine, and in particular, the Emergency Command Centre. Further discussion of the impact of this failure is contained in Chapter 2.3 Fighting the Hazelwood mine fire.

RESOURCING FOR THE FIRE RISK

While Fire Preparedness and Mitigation Plans were prepared, the Board is critical of the fact that the Fire Preparedness and Mitigation Plans were not updated once the Hernes Oak–McDonald's Track fire ignited on Friday afternoon 7 February 2014 and became a serious threat to the mine. The Plans should have been reviewed and modified to reflect the changing and serious situation taking place.

The Fire Preparedness and Mitigation Plans relied on the CFA being able to promptly respond to a fire in the mine. GDF Suez should have made a more considered assessment of the likely pressures that the CFA would be under in the circumstances, given that the Hernes Oak–McDonald's Track fire was going on 7 February 2014 and conditions over the weekend were predicted to be the worst since Black Saturday. GDF Suez should have appreciated that it was likely that the CFA would be responding to fires over the weekend, leaving fewer resources to assist the mine in the event that assistance was necessary. GDF Suez should have more closely liaised with the CFA to understand the CFA's position with respect to resourcing and its consideration about the likely threat to the mine.

Accordingly, GDF Suez should have revised its assessment of staffing levels and the other protective measures it planned to implement over the weekend. Save for two additional contractors supplementing the usual weekend staff, no additional staff were rostered on. Senior managers should have been on site to take control of any fire threats within the mine to enable the 1x7 and 2x12 crews to fulfil fire spotting and suppression roles.

Attention should have been directed to the Mine Shift Supervisor and the ESLO on Friday 7 February 2014 to ensure both were ready and prepared to action the Fire Preparedness and Mitigation Plans and to activate the Emergency Command Centre in the event it was required.

FAILURE TO LIAISE WITH EMERGENCY SERVICES

The Board heard evidence from the Incident Controller that over the course of the weekend, several Phoenix Rapidfire models were produced, showing the significant threat to the Hazelwood mine in the event that the Hernes Oak–McDonald's Track fire broke its containment lines.

The Incident Controller held briefings with the CGEIG Chair to inform him of the latest information relevant to the fire activity in the Latrobe Valley, together with the Incident Controller's assessment of the risks faced by members of the CGEIG. The Incident Controller relied on the CGEIG to provide that relevant information to CGEIG's members. The Board accepts the evidence of Mr Jeremiah and Mr Lapsley that communications of emergency risks through CGEIG had occurred successfully in the past and that there was the same expectation in relation to the risks present on the weekend of 8 and 9 February 2014.

The Board heard evidence from Mr Roach that information was provided by the Chair of CGEIG to him in relation to the fire activity and predicted weather. Mr Roach confirmed receiving one Phoenix Rapidfire model from the Chair of CGEIG.

The significance of the threat to the mine, appreciated by Mr Jeremiah by reference to the Phoenix Rapidfire modelling, was not so appreciated by GDF Suez personnel.

The evidence of Mr Roach was that he did not understand the Phoenix Rapidfire model provided to him, despite discussions with the Chair of CGEIG on 8 February 2014. The evidence suggests that Mr Roach did not discuss the model again on Sunday 9 February 2014 despite indications to Mr Harkins that he would gain a better understanding by doing so. Accordingly, it seemed that Mr Roach disregarded the model and its utility in appreciating the possible risks that would flow from a break-out of the contained Hernes Oak–McDonald's Track fire.

GDF Suez submitted that it was unsafe for the Incident Controller to rely upon or expect a third party, such as the CGEIG Chair, to pass on and explain significant information regarding a critical risk to the Hazelwood mine. GDF Suez further submitted that the provision of only one Phoenix Rapidfire model in circumstances where several predictive models had been prepared was not sufficient information. GDF Suez also criticised the Incident Controller for simply forwarding the model to the CGEIG Chair without any accompanying detailed explanation about the meaning of the simulation.[216]

The Board agrees that there is a risk that all relevant information about the risks of the spread of fire will not be passed on, or certain information may be lost in translation, if reliance is placed on third parties. The Board notes that the Phoenix Rapidfire model provided by the Traralgon Incident Control Centre to CGEIG by email had no explanation about the significance of the model. Further, the evidence suggests that this was the only model sent to GDF Suez by CGEIG. From the three models produced to the Board in evidence, this model appears to have been the least relevant of the prediction models that the Traralgon Incident Control Centre had available to it on Saturday 8 February 2014.

OPPORTUNITIES FOR ENHANCING GDF SUEZ PREPARATION

GDF Suez has recognised further preparation for the risk of fire could have been done and has committed to undertaking the following actions:[217]

- nominating a group of staff to be trained in the Phoenix Rapidfire modelling tool before the next fire season
- establishing an emergency command structure at the mine to deal with extreme fire danger days whenever they arise and nominate a pool of candidates who are able to act in these roles when required
- assigning, in advance, particular roles under that emergency command structure to personnel selected from that pool of candidates to act in these roles on site
- notifying the CFA of the identity and contact details of the personnel holding these roles
- providing more training to personnel who are intended to perform a role under the emergency command structure
- ensuring more personnel are rostered on and that additional contractors are available for dedicated fire protection duties
- reducing vegetation in the worked out areas of the northern batters of the mine to reduce fire risk

- reviewing the current pipework and condition and maintaining and using the additional pipe system located in the northern batters installed in 2014
- on extreme fire days, instigating wetting down of non-operational areas.

The Board affirms these actions.

OPPORTUNITIES FOR ENHANCING EMERGENCY PREPARATION

The Victorian Government's second submission to the Inquiry, dated 18 June 2014, notes that it is considering reforms to emergency management planning. These reforms would ensure consistency across both public and privately owned land, better cater for complex land use, and take account of the diverse hazards of specific industries and facilities (like the Hazelwood mine) to mitigate risks in a coordinated way. The Board affirms the Victorian Government's commitment to improve the State's planning framework for emergencies.[218] Further, the Board affirms the commitment of the Victorian Government to improve its engagement with the coal mining sector regarding emergency management plans.[219]

The Victorian Government's second submission also discusses the White Paper reforms to further improve Victoria's emergency management arrangements. The reforms are intended to ensure that an 'all hazards, all agencies' approach is embedded in managing emergencies, that streamlined arrangements for emergency management governance are introduced, that shared responsibility, cooperation and clarity of roles and responsibilities is encouraged, with a stronger emphasis on emergency risk mitigation, and that the importance of improved planning processes is recognised.

The Board affirms the Victorian Government's commitments to carry out the emergency management reforms, namely:

- developing a Strategic Action Plan to improve and strengthen Victoria's emergency management capability
- establishing Emergency Management Victoria as the new overarching body for emergency management in Victoria
- establishing an Emergency Management Commissioner to ensure that all control arrangements are in place, and to coordinate the response roles of relevant agencies' resources
- establishing Inspector General Emergency Management as the assurance authority for Victoria's emergency management arrangements.[220]

1. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DHS.0004.003.0001), p. 1–8
2. Written submission of Victorian Government, 22 May 2014, para. 6.8; Exhibit 1 – Statement of Craig Lapsley, para. 9
3. Exhibit 1 – Statement of Craig Lapsley, paras 1, 3 & 9
4. *Emergency Management Act 1986* (Vic), s. 4(1) (as in force prior to 1 July 2014); *Fire Services Commissioner Act 2010* (Vic), s. 3
5. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DHS.0004.003.0204), p. 3
6. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DOJ.0001.001.0172), p. 3–1
7. Exhibit 59 – Statement of Kylie White, para. 56 attachment, Part 7: Emergency Management Manual Victoria (DSDBI.0006.004.0001), pp. 7–1 & 7–4
8. Exhibit 59 – Statement of Kylie White, para. 56 attachment, Part 7: Emergency Management Manual Victoria (DSDBI.0006.004.0001), p. 7–27
9. Exhibit 59 – Statement of Kylie White, para. 56 attachment, Part 7: Emergency Management Manual Victoria (DSDBI.0006.004.0001), p. 7–30
10. Exhibit 59 – Statement of Kylie White, para. 56 attachment, Part 7: Emergency Management Manual Victoria (DSDBI.0006.004.0001), p. 7–54
11. Exhibit 59 – Statement of Kylie White, para. 56 attachment, Part 7: Emergency Management Manual Victoria (DSDBI.0006.004.0001), p. 7–3
12. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DOJ.0001.001.0172), p. 3–8
13. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, pp. 1 & 5
14. Adapted from Exhibit 15 – Statement of Lawrence Jeremiah, attachment 11, p. 2
15. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, p. 2
16. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, pp. 1 & 5
17. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, pp. 2 & 5
18. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DOJ.0001.001.0172), p. 3–12
19. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, p. 4
20. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DOJ.0001.001.0172), p. 3–12
21. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DOJ.0001.001.0172), p. 3–12
22. Victorian Government Documents, 23 April 2013, Standard Operating Procedures Subject – Control of Major Fires SOP 05/2011 (DOJ.0001.001.0516)
23. Exhibit 1 – Statement of Craig Lapsley, para. 37
24. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, pp. 5 & 18
25. Exhibit 56 – Statement of Alan Hall, attachment 3, Emergency Management Manual Victoria (DOJ.0001.001.0172), pp. 3–5 & 3–25
26. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, p. 20
27. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 6, pp. 5, 20
28. See for example, Exhibit 1 – Statement of Craig Lapsley, para. 105 attachment, Incident Shift Plan Day (10/2/14) (FSC.0006.001.0001) (FSC.0006.007.0103)
29. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 2, p. 1
30. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 3, p. 1
31. Australian Fire and Emergency Service Authorities Council Limited 2013, *The Australasian Inter-service Incident Management System*, AFAC, East Melbourne
32. Australian Fire and Emergency Service Authorities Council Limited 2013, *The Australasian Inter-service Incident Management System*, AFAC, East Melbourne
33. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 3
34. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 3, p. 10
35. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 3, p. 8
36. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 3, p. 8
37. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 3, p. 8
38. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 3, p. 3
39. Exhibit 6 – Statement of Jaymie Norris, para. 9
40. Adapted from Exhibit 6 – Statement of Jaymie Norris, para. 12; Phoenix Rapidfire presentation
41. Exhibit 6 – Statement of Jaymie Norris, para. 12; Phoenix Rapidfire presentation
42. Exhibit 6 – Statement of Jaymie Norris, para. 18
43. Exhibit 6 – Statement of Jaymie Norris, para. 16
44. Norris T138:2 – T185:15
45. Exhibit 15 – Statement of Lawrence Jeremiah, attachment 11
46. Exhibit 15 – Statement of Lawrence Jeremiah, para. 91
47. Exhibit 10 – Statement of Steven Harkins, para. 21
48. Central Gippsland Essential Industries Group 2011, *Welcome,* CGEIG, viewed 28 July 2014, http://www.cgeig.com
49. Exhibit 10 – Statement of Steven Harkins, para. 21
50. Jeremiah T475:26-28
51. *Occupational Health and Safety Act 2004* (Vic), s. 21
52. *Occupational Health and Safety Act 2004* (Vic), s. 23
53. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.9
54. Exhibit 10 – Statement of Steven Harkins, para. 11; Exhibit 13 – Statement of Robert Dugan, para. 27
55. Written submission of GDF Suez, 18 June 2014, para. 17
56. Occupational Health and Safety Regulations 2007 (Vic), rr. 5.3.34(1)-(2)
57. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.34(3)(a)
58. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.34(3)(b)
59. Occupational Health and Safety Regulations 2007 (Vic), rr. 5.3.34(4)-(5)

60. Exhibit 11 – Emergency Response Plan, s. 5.1
61. Exhibit 13 – Statement of Robert Dugan, paras 25 & 26
62. Exhibit 59 – Statement of Kylie White, annexure KAW–3, p. 63
63. Exhibit 13 – Statement of Robert Dugan, para. 33(a)
64. Prezioso T372:12-25
65. Exhibit 4 – Statement of William Brown, annexure WB–3, ss. 3.1-3.2 & 7.1.2
66. Exhibit 4 – Statement of William Brown, annexure WB–3, s. 3.4
67. Exhibit 4 – Statement of William Brown, annexure WB–3, p. 14
68. Exhibit 90 – Statement of Richard Polmear, para. 27
69. Polmear T2056:3-9
70. Exhibit 13 – Statement of Robert Dugan, paras 65 & 66
71. Prezioso T372:19-29
72. Exhibit 10 – Statement of Steven Harkins, paras 90 & 91; Harkins T339:15 – T340:2; Prezioso T371:26 – T371:30; Written submission of GDF Suez, 18 June 2014, paras 112-115
73. Written submission of GDF Suez, 18 June 2014, para. 112
74. Exhibit 10 – Statement of Steven Harkins, para. 90; Prezioso T371:10-12; Faithful T386:28 – T387:10
75. Exhibit 4 – Statement of William Brown, annexure WB–3, p. 27
76. Exhibit 4 – Statement of William Brown, annexure WB–3, pp. 27 & 28
77. Polmear T2064:2-6
78. Incoll T2191:13-18
79. Incoll T2190:6 – T2191:10
80. Prezioso T372:10-11
81. Exhibit 13 – Statement of Robert Dugan, annexure 2, p. 12
82. Exhibit 13 – Statement of Robert Dugan, annexure 2, p. 21
83. Exhibit 13 – Statement of Robert Dugan, annexure 4, p. 14
84. Exhibit 13 – Statement of Robert Dugan, annexure 5, p. 2
85. Exhibit 93 – Statement of Romeo Prezioso, para. 57; Exhibit 93 – Statement of Romeo Prezioso, annexure 2
86. Exhibit 4 – Statement of William Brown, annexure WB–3, p. 36
87. Exhibit 12 – Mine Fire Instructions, p. 12
88. Exhibit 12 – Mine Fire Instructions, p. 12
89. Exhibit 12 – Mine Fire Instructions, p. 14
90. Exhibit 11 – Emergency Response Plan, pp. 10-14
91. Exhibit 13 – Statement of Robert Dugan, para. 33
92. Exhibit 11 – Emergency Response Plan, pp. 12-14
93. Exhibit 13 – Statement of Robert Dugan, para. 11
94. Harkins T753:11-13; Exhibit 58 – Statement of Steven Harkins, para. 4
95. Harkins T753:11-13; Exhibit 58 – Statement of Steven Harkins, para. 4
96. Harkins T753:13-18
97. Exhibit 25 – Statement of Robert Dugan, para. 22
98. Exhibit 4 – Statement of William Brown, annexure WB–3, p. 14
99. Exhibit 4 – Statement of William Brown, annexure WB–3, p. 38
100. Exhibit 13 – Statement of Robert Dugan, para. 29
101. Exhibit 11 – Emergency Response Plan, p. 36
102. GDF Suez Documents, 5 May 2014, Fire Person Duties Training Manual (issued 23 August 2012)
103. GDF Suez Documents, 5 May 2014, Mine Fireman Assessment (issued 24 February 2012)
104. Exhibit 1 – Statement of Craig Lapsley, para. 187
105. Exhibit 13 – Statement of Robert Dugan, para. 35
106. Exhibit 13 – Statement of Robert Dugan, para. 35
107. Exhibit 10 – Statement of Steven Harkins, para. 14
108. Exhibit 1 – Statement of Craig Lapsley, paras 180-187
109. Exhibit 4 – Statement of William Brown, annexure WB–3, p. 38
110. GDF Suez Documents, 5 May 2014, Check List For Season Specific Fire Preparedness and Mitigation Planning (24 November 2008)
111. GDF Suez Documents, 5 May 2014, Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning (issued 13 September 2007), p. 7
112. GDF Suez Documents, 5 May 2014, Check List for Fire Fighting Equipment Annual Inspection (issued 18 January 2013)
113. Exhibit 13 – Statement of Robert Dugan, para. 34
114. Exhibit 10 – Statement of Steven Harkins, para. 19
115. Exhibit 10 – Statement of Steven Harkins, annexure 3
116. Exhibit 4 – Statement of William Brown, paras 21, 22 & 27; Brown T157:27 – T159:8
117. GDF Suez Documents, 5 May 2014, Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning (issued 13 September 2007), p. 7

118. GDF Suez Documents, 5 May 2014, Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning (issued 13 September 2007), pp. 11-12
119. Exhibit 13 – Statement of Robert Dugan, para. 32
120. Exhibit 11 – Emergency Response Plan, p. 16
121. Exhibit 11 – Emergency Response Plan, p. 27
122. Exhibit 11 – Emergency Response Plan, pp. 7-8
123. Exhibit 11 – Emergency Response Plan, p. 9
124. Exhibit 11 – Emergency Response Plan, pp. 19-26
125. Exhibit 10 – Statement of Steven Harkins, para. 20
126. Exhibit 11 – Emergency Response Plan, pp. 19-26
127. Exhibit 1 – Statement of Craig Lapsley, para. 4
128. Exhibit 1 – Statement of Craig Lapsley, paras 29-32
129. Exhibit 1 – Statement of Craig Lapsley, paras 23 & 24
130. Exhibit 1 – Statement of Craig Lapsley, para. 26
131. Exhibit 1 – Statement of Craig Lapsley, para. 26
132. Exhibit 1 – Statement of Craig Lapsley, paras 21, 26, 28, 34, 35 & 41
133. Exhibit 15 – Statement of Lawrence Jeremiah, para. 15
134. Exhibit 1 – Statement of Craig Lapsley, para. 39; Exhibit 15 – Statement of Lawrence Jeremiah, attachment 5, p. 7
135. Exhibit 15 – Statement of Lawrence Jeremiah, para. 16
136. Exhibit 15 – Statement of Lawrence Jeremiah, para. 5
137. Exhibit 15 – Statement of Lawrence Jeremiah, paras 23-28
138. Exhibit 15 – Statement of Lawrence Jeremiah, paras 19-23
139. Lapsley T712:14 – T713:6
140. Exhibit 15 – Statement of Lawrence Jeremiah, paras 89-91
141. Exhibit 1 – Statement of Craig Lapsley, para. 36
142. Exhibit 1 – Statement of Craig Lapsley, para. 35
143. Exhibit 1 – Statement of Craig Lapsley, paras 67 & 68
144. Exhibit 15 – Statement of Lawrence Jeremiah, paras 45 & 46
145. Exhibit 15 – Statement of Lawrence Jeremiah, paras. 47 & 49; Exhibit 1 – Statement of Craig Lapsley, paras 69 & 71-73
146. Exhibit 15 – Statement of Lawrence Jeremiah, paras 51 & 52
147. Exhibit 15 – Statement of Lawrence Jeremiah, para. 106; Jeremiah T474:24-31
148. Exhibit 10 – Statement of Steven Harkins, annexure 7
149. Jeremiah T475:14-22
150. Exhibit 15 – Statement of Lawrence Jeremiah, para. 29
151. Exhibit 15 – Statement of Lawrence Jeremiah, para. 30
152. Lapsley T41:6-13
153. Exhibit 15 – Statement of Lawrence Jeremiah, para. 53
154. Jeremiah T472:26 – T473:16
155. Exhibit 1 – Statement of Craig Lapsley, para. 84; Exhibit 15 – Statement of Lawrence Jeremiah, paras 55 & 57
156. Victorian Government Documents 23 April 2014, SCC Activation Level: Tier 3 (Red), 9/2/2014 (DOJ.0001.0001.0227)
157. Exhibit 1 – Statement of Craig Lapsley, para. 75
158. Exhibit 15 – Statement of Lawrence Jeremiah, para. 59
159. Exhibit 1 – Statement of Craig Lapsley, para. 85
160. Exhibit 15 – Statement of Lawrence Jeremiah, para. 39
161. Lapsley T36:17-21
162. Exhibit 1 – Statement of Craig Lapsley, paras 85 & 86; Exhibit 15 – Statement of Lawrence Jeremiah, para. 65
163. Exhibit 1 – Statement of Craig Lapsley, para. 45
164. Exhibit 15 – Statement of Lawrence Jeremiah, para. 66
165. Exhibit 15 – Statement of Lawrence Jeremiah, para. 68
166. Exhibit 15 – Statement of Lawrence Jeremiah, para. 68
167. Exhibit 15 – Statement of Lawrence Jeremiah, para. 72
168. Exhibit 72 – Statement of Lance King, paras 46 & 47
169. Exhibit 15 – Statement of Lawrence Jeremiah, para. 73
170. Exhibit 84 – Statement of Steven Warrington, paras 5, 9-11 & 13
171. Exhibit 10 – Statement of Steven Harkins, annexure 5
172. Exhibit 7 – Statement of David Shanahan, annexure 4
173. Exhibit 7 – Statement of David Shanahan, para. 28; annexure 4; annexure 5
174. Shanahan T263:4 – T264:26
175. Exhibit 11 – Emergency Response Plan, p. 12

176. Prezioso T358:7-8
177. Faithful T385:12-13
178. Prezioso T358:9
179. Prezioso T358:10-11
180. Harkins T319:19 – T321:1
181. Exhibit 7 – Statement of David Shanahan, para. 17; Shanahan T215:8-12; Exhibit 10 – Statement of Steven Harkins, paras 30 & 31
182. Shanahan T216:13-17
183. Exhibit 10 – Statement of Steven Harkins, para. 30
184. Exhibit 10 – Statement of Steven Harkins, annexure 7
185. Roach T635:18-20
186. Roach T635:28 – T636:24
187. Exhibit 10 – Statement of Steven Harkins, annexure 7
188. Roach T637:14-28
189. Harkins T322:29 – T324:2; T340:27 – T341:4; T349:23 – T350:27
190. Harkins T324:2-5
191. Roach T639:31 – T642:9
192. Roach T635:15 – T636:24; T637:10-13
193. Exhibit 15 – Statement of Lawrence Jeremiah, para 106
194. Harkins T350:17 – T351:5; T352:3-17
195. Exhibit 10 – Statement of Steven Harkins, para. 31
196. Exhibit 13 – Statement of Robert Dugan, para. 37
197. Exhibit 7 – Statement of David Shanahan, annexure 4; annexure 6
198. Exhibit 7 – Statement of David Shanahan, para. 31
199. Exhibit 7 – Statement of David Shanahan para. 16
200. Exhibit 58 – Third statement of Steven Harkins, para. 4
201. Exhibit 8 – Statement of James Mauger, para. 17
202. Exhibit 25 – Police statement of Alan Roach, p. 3
203. Exhibit 25 – Log of events produced by Mr Roach, p. 1
204. Exhibit 8 – Statement of James Mauger, para. 18
205. Exhibit 8 – Statement of James Mauger, para. 19; Exhibit – Statement of David Shanahan, para. 41
206. Exhibit 8 – Statement of James Mauger, para. 19
207. Exhibit 8 – Statement of James Mauger, para. 20
208. Exhibit 8 – Statement of James Mauger, para. 21
209. Exhibit 10 – Statement of Steven Harkins, annexure 9
210. Exhibit 73 – ESTA logs from 7 February to 24 February 2014 provided by VGSO
211. Roach T649:11-13; Prezioso T368:3-9; Harkins T328:2-4, T332:23-25
212. Prezioso T358:31 – T359:8; T361:4-8; Exhibit 7 – Statement of David Shanahan, paras 43 & 45
213. Exhibit 25 – Log of events produced by Mr Roach, p. 1
214. Exhibit 7 – Statement of David Shanahan, paras 46 & 47
215. Exhibit 7 – Statement of David Shanahan, para. 49
216. Written submission of GDF Suez, 18 June 2014, para. 64
217. Graham T2236:29 – T2238:11
218. Second written submission of the Victorian Government, 18 June 2014, paras 4.10 & 4.11
219. Second written submission of the Victorian Government, 18 June 2014, paras 4.14 & 4.16
220. Second written submission of the Victorian Government, 18 June 2014, paras 3.4 & 3.8

2.3 FIGHTING THE HAZELWOOD MINE FIRE

OVERVIEW

This Chapter examines efforts to fight the fire in the Hazelwood mine after it ignited on 9 February 2014 and over the following 45 days until it was declared safe.

Under its Terms of Reference, the Board of Inquiry must report on the adequacy and effectiveness of the response to the Hazelwood mine fire by GDF Suez, emergency services and other relevant government agencies.

This Chapter considers the firefighting response in three phases – the initial response on 9 February 2014, firefighting between 10 and 18 February 2014, and the revised fire suppression strategy implemented from 19 February 2014.

Fire services responded to the Hernes Oak and Driffield fires effectively and successfully prevented the Hernes Oak fire from damaging property in Morwell and the Driffield fire from entering the mine (together with GDF Suez personnel).

GDF Suez was responsible for the initial response to the mine fire on 9 February 2014. GDF Suez was successful in keeping the Driffield fire from crossing the mine's boundary at the Morwell River diversion. However, fire that did spot into the mine quickly spread in the northern batters, the eastern batters, the south-eastern batters, and the mine floor. There were also multiple fires within the mine at grass level. Mine personnel were successful in preventing the spread of the fire into the operating areas of the mine.

Firefighting was impeded because the GDF Suez reticulated fire services water system was not installed, or was only installed to a limited extent, in areas where the fire took hold. This meant that there were significant areas of the mine that were unable to be prepared or 'wet down' prior to the fire entering the mine and suppressed by water sprays.

By late afternoon, firefighting efforts were further impeded by the loss of power, which affected the GDF Suez reticulated fire services water system and the Emergency Command Centre. The fires were so widespread by early evening that firefighting in the worked out areas of the mine was considered too dangerous, and firefighting was limited to suppressing the fires at grass level. Fire services took command of the firefighting that evening.

The second phase of firefighting was led by fire services. Planning of a suppression strategy was undertaken across incident, regional and state levels, with GDF Suez playing a significant role. During this phase of firefighting, the mine fire was declared a HazMat incident. This phase saw the commencement of the expansion of the existing reticulated fire services water system as part of suppression efforts.

During the third phase of the firefighting effort, a new fire suppression strategy was implemented, following consultation with an expert reference group. This strategy was ultimately successful.

The Board heard evidence from GDF Suez employees about their experiences on 9 February 2014 and their involvement in firefighting over the following weeks. The Board also heard evidence from fire services personnel, including the various Incident Controllers in charge of suppression efforts over the duration of the fire. CFA volunteers also gave evidence to the Board about their experiences and observations in fighting the mine fire on 9 February 2014.

The Board heard from expert witnesses Mr Roderic Incoll, Bushfire Risk Consultant, and Professor David Cliff, Professor of Occupational Health and Safety in the Minerals Industry and Director of the Minerals Industry Safety and Health Centre, University of Queensland. Both expert witnesses gave evidence that was critical of the initial suppression activities.

The Board had regard to the measures adopted for preparing for the risk of the mine fire by GDF Suez, including preparing Hazelwood Mine Fire Preparedness and Mitigation Plans, wetting down the mine and creating fire-breaks. The Board also considered measures taken by the State in the context of resourcing issues and other demands on the State at the time the mine fire took hold. These issues are discussed in more detail in Chapter 2.2 Preparing for fire.

The Board commends all firefighters who worked under difficult conditions to protect Hazelwood mine assets and prevent fire spreading into the operational area of the mine. The Board commends fire services for protecting the community in the Latrobe Valley from the fire on 9 February 2014 and for leading the successful suppression of the mine fire.

The Board concludes that the initial efforts of GDF Suez to suppress the fires in the northern, eastern and south-eastern batters and on the mine floor were ineffective, due in large part to the mine operator being inadequately prepared for the fire. Areas of particular concern include the limitations of the reticulated fire services water system, GDF Suez's resourcing for fire prevention and suppression, issues with the activation of GDF Suez's Emergency Response Plan, and power failures affecting water supply and the Emergency Command Centre.

The Board further concludes that whilst the State and GDF Suez improved their knowledge about best practice brown coal mine firefighting during the mine fire, both the State and GDF Suez remain without appropriate firefighting equipment that is readily available.

Finally, the Board concludes that the firefighting efforts could have been enhanced and greater effectiveness achieved, if the State and GDF Suez had a more integrated approach to firefighting.

RESPONSE TO FIRE IN THE MINE

BACKGROUND

Under the *Country Fire Authority Act 1958* (Vic) (CFA Act), the Country Fire Authority (CFA) has a duty to take and enforce steps to prevent and suppress fires for the 'protection of life and property' in the country areas of Victoria.[1] The country areas of Victoria include private land and all the areas that lie outside the metropolitan district and outside public land, including state forests, national parks and protected public land.[2]

The Hazelwood mine is located on privately owned land that is part of the country area of Victoria. It is the duty of the CFA to prevent and suppress fires at the Hazelwood mine when notified by GDF Suez, dependent on other demands that fire services are managing at the time.

Over recent years, the CFA has improved firefighting capability in the Latrobe Valley. Two aerial appliances have been acquired with the support of the Victorian Government, and located at Traralgon. In the last five years, the firefighting fleet has been modernised and additional firefighters have been employed at the Morwell and Traralgon CFA brigades.[3]

The Hazelwood mine is located within the Yallourn North, Morwell and Traralgon fire brigade districts. The Morwell and Traralgon CFA fire brigades include career and volunteer firefighters. Yallourn North and other brigades within the Latrobe Valley are wholly volunteer firefighter brigades. The Yallourn North, Morwell and Traralgon CFA fire brigades support the response to fire at the Hazelwood mine. When a fire situation escalates, brigades may be called in from across the Latrobe Valley, including from the Churchill, Moe and Narracan CFA brigades.[4]

The Hazelwood mine fire ignited on the afternoon of 9 February 2014. As discussed in Chapter 2.1 Origin and circumstances of the Hazelwood mine fire, the mine fire was not just one fire but a complex of fires that started in various areas of the mine throughout the day. The fires that started in the mine originated from spotting from multiple bushfires, making firefighting efforts more difficult.

Efforts to fight the fires in the Hazelwood mine continued for 45 days until the fire was declared safe.

Discussion of firefighting has been divided into the following timeframes:

- Phase 1: 9 February 2014
- Phase 2: 10–18 February 2014
- Phase 3: 18 February–25 March 2014.

The Board has constructed a timeline of the firefighting that took place in the mine, in particular for Phase One, by considering the evidence of several GDF Suez personnel and CFA volunteers who were directly involved and who took photographs, videos, and made logs and other contemporaneous records. As discussed in Chapter 2.1 Origin and circumstances of the Hazelwood mine fire, the Board considers that to the extent that the evidence was based on personal recollections only, the times of certain events are a 'best recollection' of the witnesses in the context of extreme circumstances faced that day.

Figure 2.22 Fire in the Hazelwood mine on 25 February 2014

Image source *Herald Sun*

PHASE ONE: 9 FEBRUARY 2014

Fire at the Hazelwood mine started in the eastern batters near 'the Knuckle' and was reported to the Mine Control Centre via radio at around 2 pm on 9 February 2014.[5] By 2.10 pm both the GDF Suez 2x12 crew and 1x7 crew were attending to the fire.[6] Mr James Mauger, GDF Suez 1x7 Operator, gave evidence to the Board that suppressing the fire was difficult from the beginning. He stated that the 'wind was making it extremely difficult to extinguish the fire because it was pushing the fire so quickly.'[7]

At around 2.10 pm, Mr Romeo Prezioso, GDF Suez Senior Mine Planner, noticed fire on the floor of the mine in the overburden dump, and directed GDF Suez personnel to attend with dozers to smother the fire.[8]

At around 2.15 pm, Mr Matthew Weddell, GDF Suez Mine Services Superintendent, and Mr Alan Roach, GDF Suez Security and Emergency Services Manager and Emergency Safety Liaison Officer (ESLO), drove to the south-west part of the mine to assess the fire situation and to open gates to enable vehicles to travel through the mine. At that time, Mr Weddell turned on sprinklers for the conveyers in that area.[9]

Mr Weddell and Mr Roach then drove to the lookout above the southern batters to assess the likely impact of the Driffield fire on the mine. Mr Roach observed embers from the Driffield fire within the mine at about 2.25 pm and made an assessment that it posed a significant threat.[10]

Mr Roach recorded in his log of events that at about 2.30 pm, he called the Traralgon Regional Control Centre and was provided with the telephone number for the Traralgon Incident Control Centre.[11] Mr Roach then rang the Traralgon Incident Control Centre and left a message for someone to return his call.[12]

At around 2.40 pm, Mr Roach, Mr Weddell and Mr David Shanahan, GDF Suez Services Superintendent, discussed protection of the mine from the Driffield fire, assuming that 'the Hernes Oak [fire] risk had passed'.[13] Tactics discussed included turning off sprinklers in the central and western end of the northern batters to supply more water to damp down the exposed coal at the west field.[14]

Mr Shanahan gave evidence that the fire service network was not designed to enable all the sprays in the mine to be turned on at the same time. Areas had to be prioritised for wetting down depending on the risks unfolding.[15] Soon after, Mr Shanahan drove to the northern/north-western batters and turned off the non-essential sprays.[16] The areas where sprays were turned off were not affected by fire.[17] At around this time, Mr Prezioso joined Mr Shanahan at the northern batters and turned on sprays to create a water-break between the worked out areas that were on fire and the western part of the northern batters (see Figure 2.23).[18] There were no sprays on the eastern end of the northern batters (west of the area already rehabilitated) that could have been activated and there were only limited sprays on the eastern and south-eastern batters.[19]

Mine personnel were aware from previous experience with mine fires that on days of extreme fire danger, fire rapidly spreads to coal that is not covered by water spray. Mr Robert Dugan, GDF Suez Mine Production Manager, stated to the Board:

> In October 2006 there was a fire at the mine caused by a mechanical failure in the operating area… Because of the strong winds (it was a Black Saturday type of day) the spark that came off the idler landed in an area of coal that was not covered by the sprays due to the wind blowing the spray pattern away… Within 20 minutes it had spread over 1.5 km and destroyed the conveyor.[20]

At around 2.43 pm, Mr Roach provided a situation report to the Planning Officer at the Traralgon Incident Control Centre regarding the threat of the Driffield fire to the Hazelwood mine. He also indicated that the mine was under ember attack.[21]

At around 2.45 pm, personnel from the 1x7 crew attended to the fire at the northern batters in one of the mine's water tankers.[22] Mr Mauger stated to the Board: 'When we arrived at the northern batters, the fire was in the middle of the batter in the scrub, which made it impossible to walk in with hoses, so we started spraying water from above the fire, to little effect.'[23]

At around 2.52 pm, Mr Steven Harkins, GDF Suez Director of People, Culture and Environment, spoke with Mr George Graham, GDF Suez Asset Manager, to advise that the situation was very serious and that he was going to declare a 'full blown emergency'.[24]

Shortly after that conversation, at around 3.10 pm, Mr Harkins made the declaration of a 'full blown emergency' and activated the Emergency Response Plan. As required under the Mine Fire Service Policy and Code of Practice, an Emergency Commander was appointed and an Emergency Command Centre established.[25] Mr Prezioso was appointed Emergency Commander and Mr Roach was tasked with establishing the Emergency Command Centre.

Mr Prezioso is not listed in the Emergency Response Plan as an Emergency Commander. Mr Harkins gave evidence to the Board that he chose Mr Prezioso as Emergency Commander because Mr Prezioso had good knowledge of the mine, was highly experienced with fires and emergency response (having been second in charge in previous fire incidents at the mine), and he was one of the mine's Emergency Safety Liaison Officers.[26] Mr Prezioso was out in the mine attending to firefighting efforts and was contacted to return to the Emergency Command Centre to assume the Emergency Commander role.

At approximately 3 pm, fire services aircraft water bombers gave some assistance with fire suppression in the northern batters.[27] The presence of the aircraft and other fire services' firefighting equipment was limited in the afternoon due to the need to protect life and property around Morwell.[28]

At about 3.20 pm, power poles caught fire in the northern batters.[29] Around this time, GDF personnel considered firefighting in the northern batters to be overwhelming. As Mr Mauger stated to the Board:

> It was too dangerous with the power lines nearly on the ground in the northern batters area… to continue fighting that fire. We continued to try and put out spot fires in nearby areas for approximately 15 minutes but to little effect, as all levels of the (northern) batters were on fire at that stage.[30]

By 3.25 pm, RTL Mining and Earthworks Pty Ltd, contractors to GDF Suez, were preparing mineral earth breaks in the western boundary of the mine to combat the risks of the advancing fire from Driffield. The 1x7 crews were also continuing patrols in this area with water carts.[31]

By around 3.30 pm, additional GDF Suez personnel had been called into the mine to assist with firefighting, bringing the number of employees and contractors on site to 58.[32]

At around 3.35 pm, Mr Roach and Mr Prezioso met at the Emergency Command Centre to access plans and drawings and consider priorities for asset protection. As Emergency Commander, Mr Prezioso's first priority was to protect the mine's assets, such as the power substations, power poles, coal conveyors and dredgers, particularly from the Driffield fire approaching the operating area of the mine.[33]

Mr Prezioso's evidence to the Board was that the 2x12 crew was directed to protect the operational areas of the mine and the 1x7 crew was directed to focus on fighting the fires in the worked out areas.[34] At some point in the afternoon, Mr Prezioso directed that the one working crane monitor with booster pump be used to fight the fire in the southern batters.[35]

Between approximately 3.47 pm and 4 pm, Mr Roach contacted the Traralgon Incident Control Centre three times. During one of these calls Mr Roach sought aircraft assistance to suppress fire at the clean water pump station at the base of the northern batters.[36] There was no evidence provided to the Board of any aircraft attending to firefighting efforts after this call.

At about 4.45 pm, two CFA tankers arrived at the mine to help protect the MWN (Morwell North) substation on the northern batters.[37]

Around 5 pm, Mr Prezioso, Mr Weddell, Mr Roach and Mr Shanahan met at the Emergency Command Centre to discuss the northern batters fire and the risks that fire posed to key infrastructure in and around that area.[38]

As the fire spread, it further damaged power supplies, which led to a loss of power throughout the mine sometime between 5 pm and 6 pm.[39] The mine has two separate SP AusNet 66kV power lines that run together across the northern batters. There are four power substations in the mine and two of these substations – MWN (Morwell North) and MWW (Morwell West) – lost power due to the damage caused by the fire. The loss of power affected the Emergency Command Centre and pumphouse 53 for the fire service network, thereby affecting the water flow to the sprinklers within the mine.

Fire damage to the mine's power system above the Hazelwood Ash Retention Area (HARA) pond caused the 11kV power supply that runs through the MWE (Morwell East) substation to be tripped. This resulted in losses of power to pumphouse 50 for the fire service network, also affecting the water flow to the sprinklers within the mine. The two MWE substation 6.6kV feeders were also tripped several times due to fire related faults.[40]

Mr Mauger gave evidence that the loss of power interfered with his ability to refill the mine's fire truck and he was forced to use gravity as a means of refilling.[41] There were no internal generators at the mine that could be switched on to power the pumps in power outages.[42]

Mr James Faithful, GDF Suez Technical Services Manager – Mine and Acting Mine Manager, gave evidence that the loss of power did not mean that there was no water in the mine accessible for firefighting. Mains fresh water refilling points were located on the northern batters and tanks C and D had water coming in from pumps 50 and 53, albeit the water in these tanks could only be accessed using gravity-fed means. Mr Faithful conceded that access to water was limited, which meant a limited capability to suppress the fire.[43]

At around 5.30 pm, GDF Suez personnel were diverted to fight a fire on the grass level near Lower Ridge Road adjacent to the mine's MWE (Morwell East) substation using one of the mine's furphies.[44]

Between 5 pm and 6 pm, a CFA strike team arrived at the mine and was directed to the Emergency Command Centre. The CFA strike team was unable to assist in any firefighting at the mine as it was subsequently diverted to protect life and property being threatened by the Driffield fire.[45]

At about 6 pm, Mr Shanahan attempted to activate sprays in the south-eastern batters but found that there was no water.[46]

At around 6.45 pm, a CFA strike team, led by a Division Commander, arrived at the mine fire with four fire tankers and a four wheel drive leader vehicle.[47] Mr Anthony Lalor, CFA Volunteer, initially attended at Energy Brix to the immediate north-east of the Hazelwood Power Station but was soon diverted to attend to the mine fire. Mr Lalor attended with the Willow Grove brigade which is located approximately 30 kilometres away from the mine; however he had some familiarity with the mine from being deployed to the mine with the CFA in earlier fires and from other visits arising from his employment as a surveyor at the mine 25 years earlier.

Mr Lalor told the Board that access to the mine at the time was difficult as there was confusion about which gate to enter the mine and how entry was to be obtained. Further, once access was obtained through a remote controlled gate, there was an additional delay, as the gate had to be opened and shut for each individual vehicle passing through.[48]

Mr Lalor gave evidence to the Board of further problems that the strike team faced whilst deployed to the mine to put out fires at grass level. These problems included having no mine escort dispatched by the mine to assist the strike team in moving around, a lack of appropriate signage for guidance in the mine, and CFA radio communications being incompatible with the GDF Suez radio communications.[49]

By 7 pm on 9 February 2014, there were 103 GDF Suez mine personnel at the mine assisting with the firefighting.[50]

At approximately 7.45 pm, the Emergency Command Centre was relocated to the mine's administration building due to the power outage.[51] Whilst there was no power in this building either, according to Mr Harkins it was a better location because it was less subject to smoke from the fire.[52]

Mr Faithful assumed the Emergency Commander role for the overnight shift at around 8 pm.[53]

At about 8.20 pm, the CFA Incident Controller arrived at the Emergency Command Centre with a strike team comprising six tankers.[54]

The CFA took operational control of the Hazelwood mine fire around 10 pm.[55] A suppression strategy and Incident Action Plan were prepared overnight by Mr Ross Male, CFA Division Commander, in partnership with operational staff at the mine.[56]

CFA firefighters who arrived at the mine at around 10 pm, described the situation as chaotic and disorganised. Mr Doug Steley, CFA Volunteer from the Cowwar brigade,[57] provided evidence to the Board that mine escorts were not always available, signage was lacking throughout the mine, proper maps were not presented and that there were difficulties in communicating with mine personnel and the Incident Control Centre.[58]

Firefighters arriving at the Hazelwood mine were overwhelmed by the extent of the fire. As Mr Lalor stated: 'It was unbelievable, it was like vertical lava flow but rather than flowing down it was flowing up and over the top of the cut… I knew that there was absolutely nothing we could do in the cut, it would be like throwing a cup of water on a camp fire.'[59]

Overnight, firefighting conditions at the mine were very difficult because of the lack of power and water, and poor visibility due to smoke.[60] As Mr Shanahan stated: 'Throughout the night, the large fires on the northern batters, the southern and eastern batters, and on the floor of the mine were not being actively fought, due to extremely dangerous conditions…'[61]

Mine electricians and others, including the external supplier SP AusNet, worked to return power to the mine by the early hours of 10 February 2014. At around midnight, work by engineers created a power supply to two water sources—the 'dirty water pumps' and the Hazelwood pondage (pump 53)—by switching works to the MWE (Morwell East) substation. Power was restored to the Emergency Command Centre between 3 am and 4 am. Restoration of SP AusNet power lines occurred in time for conveyors to start work at around 6 am to supply coal to the Hazelwood Power Station.[62]

The Incident Action Plan developed by Mr Male, at the end of the night shift on 9–10 February 2014, records suppression objectives as:

- continued provision of asset protection to key infrastructure in order to maintain coal production
- restoring the 66kV power lines into the mine so that water pumps were operational for firefighting.[63]

Fire was widespread at the Hazelwood mine by the morning of 10 February 2014. According to the Incident Action Plan prepared by Mr Male, fire had spread across three levels in the northern batters, extending for approximately two kilometres. Another fire was burning over approximately one kilometre of the eastern batters, and a fire of approximately 500 metres by 500 metres was burning in the floor of the mine.[64] The fire-breaks and other firefighting efforts of 9 February 2014 meant that fire had not spread into the operational areas of the mine and power production from the mine was not significantly interrupted (see Figure 2.23).[65]

Figure 2.23 Photograph of water-break on the northern batters at 5.30 am on 10 February 2014[66]

A water-break in the northern batters prevented the fire from spreading west towards the operational area of the mine. Photograph taken by Mr Steley.

PHASE TWO: 10–18 FEBRUARY 2014

After the CFA took control of the Hazelwood mine fire, planning for full suppression of the fire was paramount. Suppression plans evolved as the firefighting continued and firefighters faced multiple issues relating to management, health, and the stability of the mine.

SUPPRESSION STRATEGY

Planning the suppression strategy for the mine fire occurred at incident, regional and state levels.[67] The Incident Controllers developed Incident Shift Plans twice daily, which identified the planning in place for dealing with the mine fire.

The Incident Shift Plan prepared for the day shift on 10 February 2014 dealt with all fires being managed by the Traralgon Incident Control Centre. It records the objectives for the shift as:

- containing and securing perimeter lines of the various fires in the Latrobe Valley region
- protecting key infrastructure in the area
- supporting the resumption of a normal community and business activities in Morwell as soon as possible.[68]

Specific to the Hazelwood mine fire, the Incident Controller determined that suppression efforts were to be undertaken by splitting up the fires in the mine into sectors and deploying four CFA tanker strike teams (16 vehicles in total), one pumper strike team, one hose laying appliance and one teleboom appliance. Two mobile radio repeaters were also used.[69]

The Incident Controller recorded strategic, health and resourcing issues as needing attention.[70] From 11 February 2014, several new strategic command structures were set up to deal with the mine fire.

At the incident level, a separate Incident Management Team was established at the mine within the Hazelwood Emergency Operations Centre.[71] Mr Steven Warrington, Regional Controller (Mines), indicated that the priority for planning and suppression activity during this period was to extinguish the fire and reduce the impact of smoke given the fire's proximity to the Morwell community.[72]

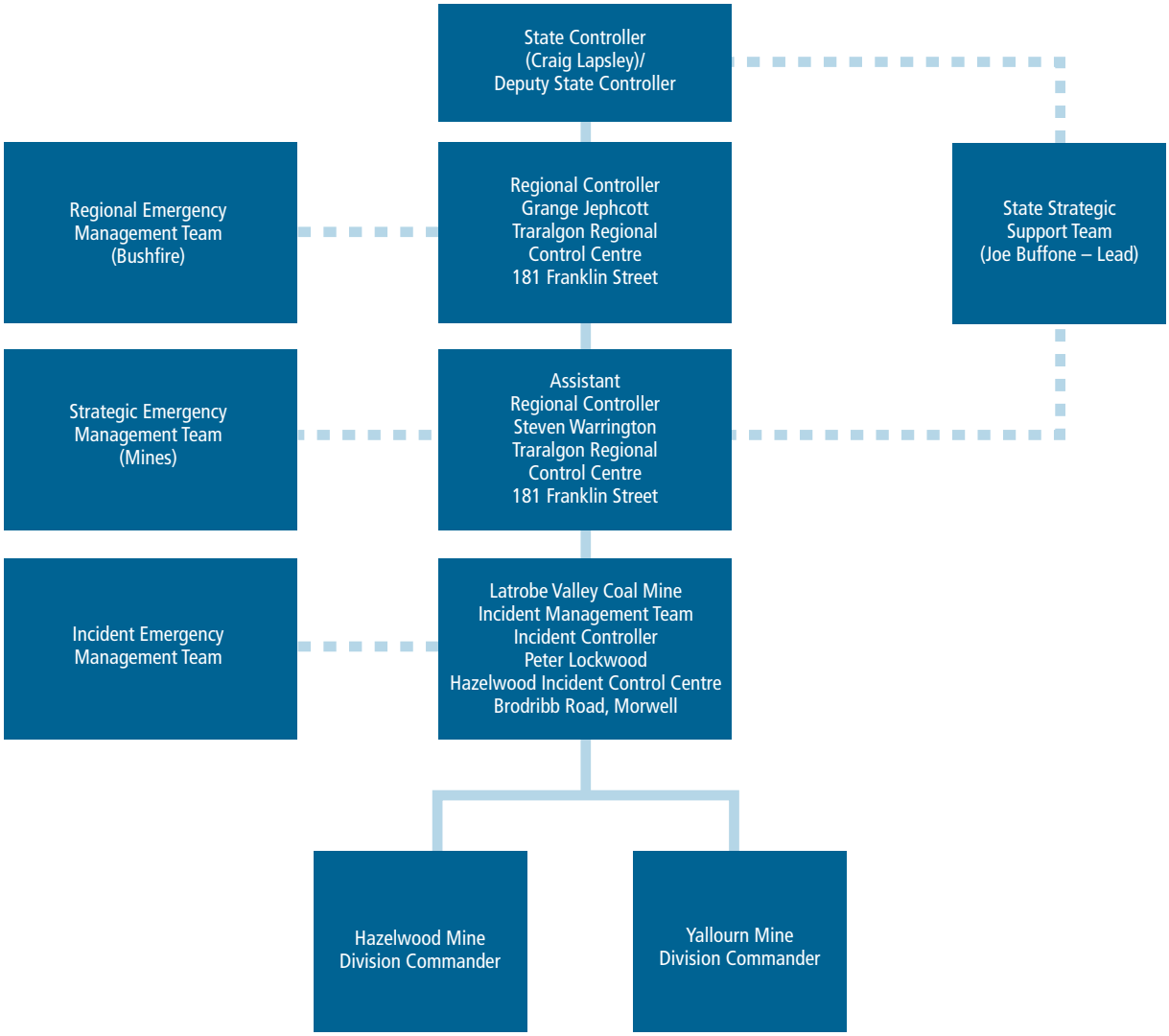
At the regional level, a Strategic Emergency Management Team (Mines) was also established to deal with issues arising from the mine fire. The team comprised a number of experts, including industry groups. Meetings with the Regional Controller were held daily at 5.30 pm.[73]

On 11 February 2014, the first iteration of the Latrobe Valley Coal Mines Fire Strategic Plan was issued. This document was generated by the fire agencies, GDF Suez and the Central Gippsland Essential Industries Group. The objective of the Latrobe Valley Coal Mines Fire Strategic Plan was to keep the fire within the worked out areas of the mine and to avoid the loss of critical infrastructure so as to maintain power generation.[74]

At the State level, a State Strategic Support Team was formed on 12 February 2014. The State Strategic Support Team developed the 'State Strategic Support Team Brief – Latrobe Valley Coal Mine', which was revised and updated throughout the mine fire.[75] The team comprised representatives from the CFA, the Metropolitan Fire Brigade (MFB), the Department of Health, the Environment Protection Authority, Victoria Police, the Department of Education and Early Childhood Development, and the Department of State Development, Business and Innovation.

The State Command structure is depicted in Figure 2.24.

Figure 2.24 State Command structure[76]



ROLE OF GDF SUEZ IN FIREFIGHTING

After control of the firefighting was taken over by fire services, GDF Suez personnel continued to contribute to the firefighting effort and provided the CFA with information and escorts to assist with navigating the mine.[77]

Initially, GDF Suez continued to have an Emergency Commander who reported to the Incident Controller.[78] By 11 February 2014, GDF Suez had set up a new emergency command structure and appointed senior personnel to ongoing roles. Mr Dugan was appointed as Emergency Commander for the day shift, Mr Faithful was Emergency Commander for the night shift, and Mr Prezioso was appointed Field Coordinator, managing the supervisors of firefighting teams.[79]

The command structures of GDF Suez and the CFA were run in parallel, with liaison taking place regularly to coordinate the firefighting.[80]

To keep informed of firefighting efforts and to coordinate future action, the GDF Suez Emergency Commanders held meetings at the start and end of each shift (6 am and 6 pm) and around midday, with GDF personnel. Other issues such as health and safety, geotechnical concerns and resourcing, were also regularly discussed. CFA Division Commanders and CFA Sector Commanders also attended these meetings.[81] In addition, Mr Dugan met with the Mine Incident Management Team at around 8.30 am each day to report on information received from the night shift and to discuss the proposed action for that particular day.[82]

By 13 February 2014, GDF Suez had divided firefighting activity into two sectors, the northern and southern batters. On 15 February 2014, these sectors were further divided into three sectors, with an additional fourth sector eventually being added. A separate supervisor within the GDF Suez Command Structure was responsible for each sector. The CFA adopted a similar structure of using sector commanders to coordinate its firefighting teams.[83]

HAZMAT INCIDENT DECLARED

On 13 February 2014, Mr Craig Lapsley, Fire Services Commissioner, determined the mine fire to be a HazMat incident.[84] A HazMat fire is a fire where hazardous materials, high consequence dangerous goods or dangerous goods are present. As the CFA is the control agency for both major fires and HazMat incidents, the command and control arrangements for the mine fire did not alter when the HazMat overlay was applied.[85] See Chapter 4.4 Firefighter health for more information.

EXPANSION OF THE RETICULATED FIRE SERVICES WATER SYSTEM

On 13 February 2014, the Incident Controller and GDF Suez mine staff determined that extra fire service pipework in the worked out areas of the mine was necessary to suppress the mine fire. With the support of the Victorian Government, the installation of extensive pipework commenced on 14 February 2014.[86]

Mr John Haynes, Incident Controller at the Hazelwood mine from 17 February 2014, gave the following evidence to the Board:

> To assist the suppression effort, the reticulation system within the mine was extended. I believe that when the fire first started reticulated water was only present in that part of the Mine which was being worked on, immediately prior to the impact of the fire. This was a different part of the Mine to that which was on fire. Extension of the water reticulation system was therefore necessary to quickly and effectively supply water to the fire trucks. It was also necessary so that fixed fire fighting infrastructure was present in such a way as to facilitate the handing back of the Mine to the Mine operation, as soon as possible.[87]

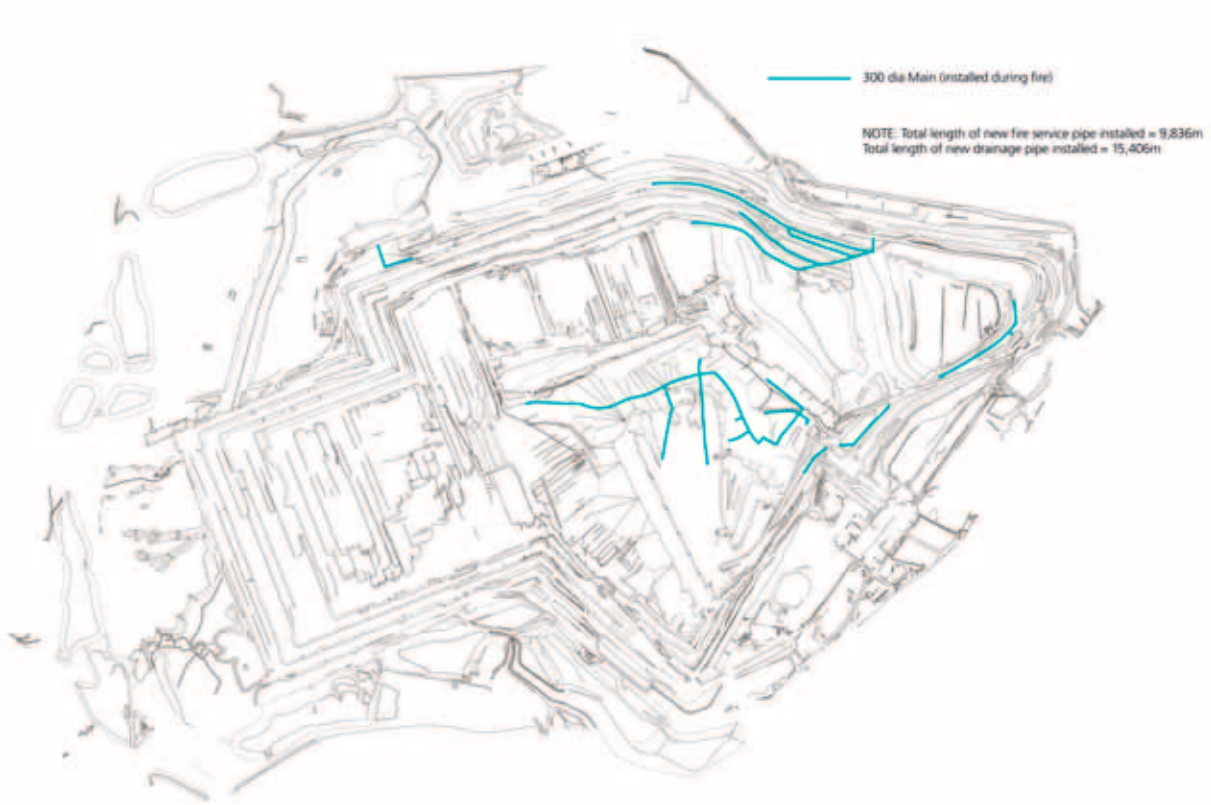
During the course of the fire, reticulation and water piping were installed by GDF Suez personnel who worked day and night, with the aid of engineers from Loy Yang and AGL. Firefighting helicopters assisted this work by cooling the areas that were being worked on.[88]

Figure 2.25 Sikorsky helicopters assisting expansion of reticulated fire services water system[89]

A photograph of the assistance by Sikorsky helicopters in the expansion of the fire service network is at Figure 2.25. In total, up to eight kilometres of 300 millimetre steel pipes were installed and welded together in the north-western batters, the mine floor and the eastern batters (see Figure 2.26).[90]

Mr Graham informed the Board that GDF Suez paid for the installation of the additional pipes at a cost of $2.5 million.[91] Mr Lapsley informed the Board that the total cost to the State of fighting the Hazelwood mine fire, as at 13 June 2014, was $32.5 million. This figure was not inclusive of the value of volunteer services.[92]

Figure 2.26 Water pipe installed during Hazelwood mine fire[93]



WATER VOLUME ISSUES WITHIN THE MINE

Those managing the firefighting were aware of the need for a significant supply of water, and the potential for that volume of water to affect stability of the mine.[94]

Mr Dugan gave evidence to the Board that the mine started to suffer water supply and storage issues leading up to the weekend commencing 15 February 2014. The number of extra firefighting appliances and spray monitors operating at the mine meant that the mine's water supply was insufficient. This issue was overcome by using the Hazelwood pondage redundancy system to supplement the mine's water supply.[95]

Once the additional water was obtained, other problems were faced in dealing with storing additional water in the storage ponds on the mine's floor as their capacity was being exceeded. The strategy implemented was to use the clean water pumps to pump excess water back into the Hazelwood pondage.[96] A further strategy was later employed, whereby large capacity pumps from the Yallourn mine were used to help pump excess water into the Hazelwood pondage. This further step was necessary as the groynes (the retaining walls between the storage ponds) were beginning to struggle to hold the volume of water. In addition, GDF Suez added extra high head pumps to pump water from the sector 3 storage pond into the fire service network.[97] Further methods were also adopted to deal with the ongoing water storage issues.[98]

Mr Lapsley gave evidence to the Board that he sought advice about the desirability of using foam to supplement water usage, to reduce concerns about stability, and to increase the success of fighting the mine fire.[99]

RELOCATION OF THE MINE INCIDENT MANAGEMENT TEAM

On 18 February 2014, the Hazelwood Mine Incident Management Team had grown to about 20 personnel. The Incident Management Team moved to the Traralgon Incident Control Centre because the facilities at the mine were not able to cater for a group of that size.[100]

As a practical consequence, the close liaison between the GDF Emergency Commander and the Incident Management Team was affected. Mr Dugan indicated that three days after the relocation, he commenced attending meetings at the Traralgon Incident Control Centre at about 1.30 pm each day.[101]

PHASE THREE: 18 FEBRUARY–25 MARCH 2014

Fire suppression efforts were constantly reviewed and updated as firefighting in the Hazelwood mine continued. In light of the time taken to suppress the mine fire, community concerns about smoke and ash affecting the township and the people of Morwell, and concerns about water use within the mine, an expert review was undertaken to ensure that the most effective methods for fire suppression were being adopted.

EXPERT REFERENCE GROUP APPOINTED

On 16 February 2014, the State Controller engaged an independent Expert Reference Group to peer review the suppression strategies being used in the mine fire. Membership of the Expert Reference Group comprised Australian and international experts, including Commissioner Greg Mullins AFSM, head of New South Wales Fire and Rescue, Adjunct Professor Tim Sullivan, expert in mining geotechnics, Mr Wayne Hartley, CEO of Queensland Mines Rescue Service, and Mr Mark Cummins, a US practitioner experienced in compressed air foam as an extinguishing agent in mine fires.[102]

The Expert Reference Group met on 18 February 2014 and 3 March 2014. As part of the decision-making process relevant to suppression and extinguishment activities, the Reference Group identified the following operational actions:

- the possible use of foams and sprinklers instead of streams of water to continue to reduce smoke and products of combustion (eg ash and embers)
- focusing on areas in the mine where critical assets are located to ensure they are protected, and having redundancy plans in place if those assets are compromised
- continuing the use of water to suppress the fire, and trialling other mediums including foams and gels
- monitoring the volumes of water used and extracted, and the impact of those volumes on the mine, and managing the ongoing extension to the reticulation system
- employing an 'aggressive focused weight of attack strategy' by using multiple approaches, fighting fire in incremental sections, and focusing on priority areas
- monitoring and analysing critical aspects of the mine fire, including movement of the batters, the depth of the fire, water use, air quality and particulate matter
- active monitoring using infra-red technology in areas previously treated to ensure fire was extinguished
- monitoring safety issues for firefighters, including carbon monoxide exposure and water quality.[103]

IMPLEMENTATION OF THE NEW FIRE SUPPRESSION APPROACH

The CFA, together with GDF Suez, implemented a new suppression plan to fight the mine fire based on the actions identified by the Expert Reference Group. Priorities continued to be:

- reducing the impact of carbon monoxide, smoke and irritants on the community, firefighters and mine workers
- protecting critical infrastructure
- containing the fire spread
- enhancing the water reticulation system in the mine.[104]

The role of Incident Controller during this period was shared between Mr Robert Barry and Mr John Haynes. Mr Barry has been with the CFA for 38 years, has extensive experience as a Regional Controller and Regional Agency Commander, and has been qualified at the highest accreditation level for an Incident Controller since November 2012.[105] Mr Haynes has been involved with the CFA (in volunteer and paid capacities) since 1981 and has been qualified as a level 3 Incident Controller for 20 years.[106]

Mr Barry was rostered on shifts between 21 February and 21 March 2014. He described the new approach to extinguishing the fire as 'like trying to eat an elephant. It had to be eaten one bite at a time.'[107] The new approach was a six-step suppression plan with the following steps:

1. segment the burning batters into 100 metre compartments on each level of the batters and extinguish the fire using water (applied by aircraft and other appliances)
2. apply compressed air foam to stop the batter from reigniting while crews moved to another section of the mine
3. deploy aerial pumpers to apply compressed air foam to the higher reaches of the batters
4. use thermal imaging cameras to determine whether steps 1 to 3 had been effective and to identify any remaining hot spots
5. suppress any hot spots identified by thermal imaging cameras
6. test other methods of suppression that could be incorporated to improve steps 1 to 5.[108]

The use of compressed air foam is not a standard firefighting method employed by the CFA or MFB fleet in Victoria, therefore Victorian fire services borrowed large compressed air foam system (CAFS) units from Tasmania and NSW.[109] Mr Barry informed the Board that by the time he commenced as Incident Controller on 21 February 2014, the Tasmanian CAFS unit was already at the mine and a number of foam agents were tested prior to 'A Class foam' being determined as the most suitable.[110] A photograph showing the application of foam on the batter is in Figure 2.27.

Figure 2.27 The use of compressed air foam to smother batters at Hazelwood mine[111]

Mr Haynes observed that the use of CAFS resulted in less smoke and ash, which was important given that the community of Morwell was so close to the northern batters.[112]

The CFA continued to use aircraft to assist in the firefighting. The Sikorsky helicopters were used with great effect in conjunction with spraying onto the batters to reach areas that booms and crane monitors could not reach.[113] A photograph of a Sikorsky helicopter fighting the mine fire is at Figure 2.28.

Figure 2.28 Sikorsky helicopters were effective in suppressing fire in steep mine batters

Image source *Keith Pakeham, CFA Pix*.
Sikorsky helicopters are different to other types of water bombers because water is delivered from a bucket beneath the helicopter. Helicopters can apply water to areas that are otherwise not accessible.

The CFA also put in place additional measures to plan and deal with spike days, when weather conditions were likely to make the firefighting more difficult and potentially cause spot fires. These measures included bringing in additional aircraft and strike teams and establishing mineral earth breaks.[114]

Mr Barry recounted to the Board that 25 February 2014 was a 'spike day':

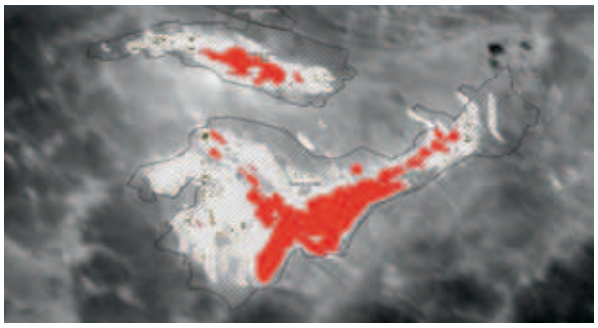
> The wind direction at that particular time caused a spot to come out of the southern batters which caught fire into the grasslands above the batters and the fire actually ran directly towards the power station and, in doing so, ran through a conveyor belt storage yard and moved up towards what they call the coal bunker. The resources that we had in place very quickly got on top of that situation and prevented the fire from entering the bunker.[115]

A photograph taken on 25 February 2014 shows the fire spotting out of the mine near the Hazelwood Power Station at Figure 2.29.

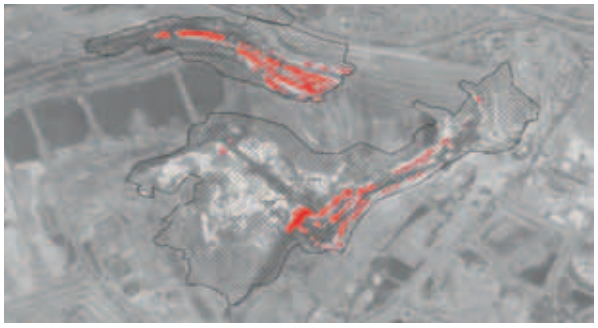
Figure 2.29 Hazelwood mine fire on a 'spike day' – 25 February 2014[116]

Despite minor setbacks on spike days, very good progress was made in extinguishing the mine fire from 18 February 2014, as depicted by infra-red photographs (Figure 2.30).

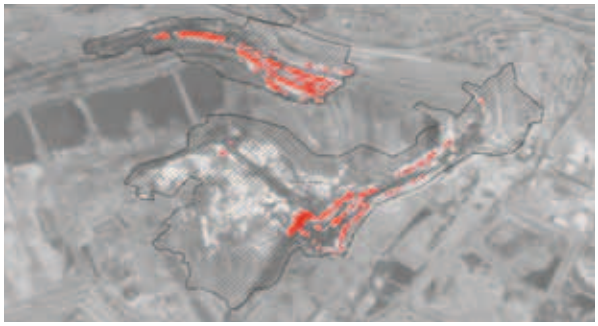
Figure 2.30 Infra-red scans of the Hazelwood mine fire 11 February 2014 to 9 March 2014[117]



11 February 2014



18 February 2014



28 February 2014

9 March 2014

HAZELWOOD MINE FIRE DECLARED SAFE

Mr Lapsley declared the Hazelwood mine fire safe on 25 March 2014.[118]

Fire services and GDF Suez invested enormous resources in the suppression of the Hazelwood mine fire.

GDF Suez contributed the equipment to firefighting including five all-terrain 30 tonne cranes with monitors, seven 30,000 litre water tankers with monitors, seven long reach 30 tonne excavators, numerous items of earthmoving equipment and approximately 70 items of mobile plant.

Up to 80 GDF Suez personnel worked on day shifts, and about 50 GDF Suez personnel worked on night shifts over the course of the firefighting effort.[119]

Fire services supplied around 200 appliances including aircraft, tankers, pumpers, ladder platforms, compressed air foam systems, thermal imaging cameras, command vehicles and support vehicles.[120]

More than 7,000 fire services personnel were involved in firefighting at the Hazelwood mine during February and March 2014.[121] Firefighting personnel were drawn from the CFA, MFB, the Department of Environment and Primary Industries, Victoria State Emergency Service, Australian Capital Territory Fire and Rescue, New South Wales Fire and Rescue, Tasmanian Fire Services, Queensland Fire Service, GDF Suez and Air Services Australia.[122]

DISCUSSION AND CONCLUSIONS

To come to any conclusions about the adequacy of the firefighting response to the Hazelwood mine fire, the Board has necessarily taken into account the measures adopted by GDF Suez and the State to prepare for the risk of fire, as well as resourcing issues and other demands on emergency services at the time the mine fire took hold. The coordination and cooperation between the State and GDF Suez in the preparation for the mine fire is also a relevant consideration. For an understanding of those matters, see Chapter 2.2 Preparing for Fire.

PHASE ONE: FIREFIGHTING ON 9 FEBRUARY 2014 BY FIRE SERVICES

The Board considers that fire services responded effectively to the breakout of the Hernes Oak fire. No properties were lost in Morwell. Fire services also responded quickly to the Driffield fire, and together with the mine personnel, successfully prevented the fire from crossing the Morwell River diversion and entering the operational area of the Hazelwood mine.

Where possible, fire services sent resources to the mine to assist with the protection of assets. During the afternoon of 9 February 2014 that assistance was necessarily limited due to the other demands on the fire services' firefighting resources.

In its submission to the Board, GDF Suez attributed part of the failure of the initial response to the Hazelwood mine fire to the limited firefighting assistance from fire services, and the demands on fire services to attend to other fires in the Latrobe Valley.[123]

The Board is satisfied that the way that fire services allocated their resources to suppress fire on 9 February 2014 was consistent with the State Controller's Strategic Priorities, where the protection of life is paramount. For discussion of the State Controller's Strategic Priorities, see Chapter 2.2 Preparing for fire.

PHASE ONE: FIREFIGHTING ON 9 FEBRUARY 2014 BY GDF SUEZ

Mine personnel successfully prevented fires in the south-eastern and northern batters of the Hazelwood mine from spreading west towards the operating areas of the mine and important mine infrastructure. This was a substantial achievement given the circumstances. Mine personnel worked strategically to turn sprays on and off in the northern batters to create a fire-break between the worked out northern batters that were on fire and the western end of the northern batters near the operational areas of the mine. The Board commends those efforts.

The Board commends GDF Suez for having maintained power to the national electricity grid through the Hazelwood Power Station during the fire.

However, despite these good efforts, the Board considers that the initial response to the fire was inadequate to suppress ember attack and contain spot fires that ignited in the mine at various locations in the afternoon of 9 February 2014. Accordingly, the fire was widespread in the worked out areas of the mine by around 7 pm on 9 February 2014.

The Board notes the following specific areas of concern with respect to firefighting on 9 February 2014.

WATER SUPPLY

The Board was informed by mine personnel and experts that the best form of fire protection was the use of water to wet down the coal faces to reduce the likelihood that fires would take hold.

Mine personnel planned to protect the mine from the risk of fire by the application of water in the mine at all times over the course of the weekend. This was recorded in Hazelwood Mine Fire Preparedness and Mitigation Plans issued on 7 February 2014. Mine personnel did follow this plan where the reticulated fire services water system was present. The Board heard evidence that the application of water from the reticulated fire services water system did create water breaks and stopped the fire in the northern batters spreading towards the operating areas of the mine.

However, in the areas where the reticulated fire services water system did not incorporate sprays and sprinklers, firefighting efforts were severely impeded. As discussed in Chapter 2.2 Preparing for fire, there was no action taken to prepare the worked out areas of the mine for the threat of fire by wetting down those areas where the reticulated fire services water system was limited or not present. The Board heard evidence from mine personnel who were fighting the fire in the northern batters, using the mine's water tankers, that they had no success in suppressing that fire shortly after it ignited, even when the fire tankers were coupled to the fire service network. Mr Mauger's evidence was that the fire quickly took hold of the northern batters and that it became too dangerous to continue firefighting efforts.

The Board concludes that the suppression of fires in the mine was severely hampered by the limited reticulated water supply and in particular the lack of sprays and sprinklers in the northern, eastern and south-eastern batters. As noted in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez, pipes had been removed from the reticulated fire services water system between 1994 and 2007 and had not been replaced, with the result that the mine's water system could not deliver adequate quantities of water to suppress the fires in the northern batters.

Expert advice from Mr Roderic Incoll, Bushfire Risk Consultant, and Professor David Cliff, Professor of Occupational Health and Safety in the Minerals Industry and Director of the Minerals Industry Safety and Health Centre, University of Queensland, suggests that the absence of a full reticulation system in the worked out batters was the critical weakness in the ability of GDF Suez to suppress the mine fire on 9 February 2014.[124] Professor Cliff suggests that the application of water was one of the few practical measures available to suppress fire in the steep slopes of the worked out batters.[125] The Board accepts the views of Mr Incoll and Professor Cliff.

RESOURCING

The Board heard evidence that with the exception of two additional contractors rostered on for the weekend of 8 and 9 February 2014, GDF Suez did not consider additional staffing necessary, despite extreme weather conditions being predicted and experienced, and the resulting serious risk of fire.

The Board acknowledges that several members of GDF Suez management, motivated by their own concerns for the impact of any fire on the mine, came into the mine before the fires took hold and were involved in key decision-making in the early afternoon of 9 February 2014. GDF Suez also rapidly increased the number of personnel present at the mine to assist once the mine fire had ignited.

The Board heard expert evidence from Mr Incoll who stated that a key principle of success in fire suppression is a fast determined first attack. Mr Incoll reported to the Board that the resources available for first attack on a mine fire of the magnitude that was experienced on 9 February 2014 were insufficient to prevent the spread of fire inside the mine.[126]

The Board concludes that additional staff present at the mine prior to the outbreak of fire would have benefitted firefighting efforts.

The Board affirms GDF Suez's commitment to ensuring that more personnel are rostered on, and additional contractors are available for dedicated fire protection duties, on extreme fire danger days (for example, instead of one 1x7 crew, the equivalent of two or more crews should be available as required in the circumstances). The amount of additional contractor support and the plant and equipment required will reflect internal staffing availability and to some extent the level of support that the CFA advises it has available.[127]

EMERGENCY RESPONSE PLAN

The Board heard evidence about GDF Suez's Emergency Response Plan and procedures that should be adopted in extreme circumstances, like a mine fire.

After the first report of fire in the mine around 2 pm on 9 February 2014, neither Mr Roach in his role as ESLO, nor Mr Ian Wilkinson, GDF Suez 2x12 Shift Supervisor, the only designated GDF Suez Emergency Commander on site at that time, declared a full blown emergency to activate the Emergency Response Plan, as required by s. 2.9 of the Plan. That initial failure had several consequences.

There was no evidence that anyone within the mine notified the CFA of the fires by calling 000. Whilst calls were made to the Traralgon Incident Control Centre during the course of the afternoon, it does not appear that any request for resources was made to the Traralgon Incident Control Centre until around 4 pm. Due to the number of fires in the Latrobe Valley and the heavy workload that fell to the Regional and Incident Control Centres, early intervention and support at State level could have been beneficial to the local response. However, the Board acknowledges the evidence of Mr Lapsley and Mr Lawrence Jeremiah, Incident Controller, that firefighting resources in the area were attending to the fires threatening the townships of Yarram and Morwell before the mine fire ignited and may not have been able to assist any earlier (see Chapter 2.2 Preparing for fire).

The Board heard that the Emergency Response Plan was not implemented until approximately 3.10 pm on 9 February 2014 (more than an hour after fire was first reported), when Mr Harkins declared a 'full blown emergency'. Once that took effect, clear command and control structures were established. However, the nominated Emergency Commander, Mr Prezioso, was not designated that role in the Emergency Response Plan. The remainder of the mine's Emergency Commanders were out of Morwell on a weekend break or holiday, with the exception of Mr Wilkinson who was present at the mine but, as noted above, did not assume that role. This is discussed further in Chapter 2.2 Preparing for fire.

Under its Emergency Response Plan, GDF Suez is required to assist the CFA in its efforts to fight fires within the mine. The Board heard evidence from CFA volunteer firefighters who attended the mine on the evening of 9 February 2014, that they met with several obstacles, including difficulties accessing the mine, lack of mine staff to escort them around the mine, lack of signage within the mine and communication problems. This evidence was of concern to the Board. The Board affirms GDF Suez's commitment to offer enhanced training specific to the Hazelwood mine to CFA brigades close to Morwell, prior to the next fire season and on an ongoing basis. This training is intended to cover:

- orientation, maps, roads within the mine and the location of firefighting infrastructure in the mine
- ongoing use of GDF Suez mine escorts to accompany emergency services vehicles on-site
- the mine's emergency response procedures and command structure in use during the fire
- communications in the mine during emergencies, including compatible radio frequencies.[128]

The Board further affirms GDF Suez's commitment to offer enhanced training to CFA personnel and other relevant emergency services agencies within a 25 kilometre radius of the mine. This 25 kilometre radius takes in town centres including Traralgon, Trafalgar, Mirboo North, Churchill, Glengarry, Yallourn and other locations. This initiative has the potential to build capacity in coal mine firefighting and GDF Suez is encouraged to extend this opportunity to a broader field of townships.[129] The Board notes that several of the attending CFA volunteers on 9 February 2014 were from brigades outside a 25 kilometre radius of the mine. Accordingly, the Board encourages GDF Suez to consider the scope of the training offered to maximise the benefit of such training.

The Board affirms GDF Suez's commitment to upgrade signage within the mine to make orientation easier for emergency services personnel.[130]

POWER FAILURE

The mine lost power around 5 pm on 9 February 2014. The two high tension power lines owned by SP AusNet that provide power to the Hazelwood mine burnt in the mine fire. GDF Suez gave evidence that it would be unlikely that both lines would be lost at the one time, even though both power lines run in parallel in the same geographical area of the mine.

The Board heard that while there are four power substations in the mine, the two substations that were affected by the power loss were responsible for supplying power to the Emergency Command Centre and the pumps for the reticulated fire services water system. Despite the great efforts of mine electricians who were able to undertake switching works to regain power to pumphouse 53 and one of the dirty water pumps around midnight, there were several hours where the mine's reticulated fire services water system was affected. There was no back-up power supply available to those substations in the event that mains power supply was lost during a fire. Without power, the reticulated fire services water system was ineffective and the Emergency Command Centre was disabled – staff could not use lighting or equipment such as CCTV monitors, computers and printers.

The Board accepts the evidence of GDF Suez personnel that the loss of power did not mean that there was no water available in the mine to fight the fires, although it concludes that the water flow was limited and water pressure was low. Refilling tankers was problematic as a consequence, which meant firefighting efforts were reduced.

The Board acknowledges that mine personnel and electrical contractors worked hard and in difficult conditions to re-establish power supply to the mine by the early hours of Monday 10 February 2014. They are commended for those efforts.

GDF Suez submitted that the power failure was the most significant of various factors that undermined the early containment and extinguishment of the fire.[131] The Board accepts that it was a significant factor but a more significant factor was the absence of appropriate water pipes and sprinklers. By the time the power loss was sustained, there was significant fire activity in the mine in areas where there was limited or no reticulated water. There was evidence to suggest that mine personnel were unable to fight the fire on the northern batters from around 3.30 pm on 9 February 2014, as the fire was burning in areas of scrub inside the mine and the conditions were too dangerous. Firefighting efforts were therefore limited to putting out spot fires.

The Board affirms GDF Suez's commitment to undertake a review of the redundancies in its electrical system. Further, the Board affirms (pending consultation with SP AusNet) GDF Suez's commitment to make permanent the temporary connection that was established between MWE (Morwell East) substation (supplied at 11kV) and the clean and dirty water pumps during firefighting efforts.[132] This requires SP AusNet to conduct a feasibility study to upgrade the MHO substation from temporary to permanent standard. This is a matter that will initially have to be taken up with SP AusNet.[133]

PHASE TWO: 10–18 FEBRUARY 2014

COOPERATION AND COORDINATION

Fire services and GDF Suez maintained two distinct command structures for the management of the Hazelwood mine fire. While this arrangement was well organised and communication and relationships were good, fire services were required to attend frequent meetings within their own structure and then additional meetings with GDF Suez fire crews.

There is potential to improve the efficiency of communication and resource use between fire services and GDF Suez. A strategy to achieve this is for both organisations to work together under one integrated emergency response structure during major fires. A more integrated approach to emergency response has the advantage of achieving more effective communication, better incorporation of local knowledge from mine personnel into the development of fire suppression strategies, and the pooling of all available resources.[134]

In keeping with the management framework for emergencies, GDF Suez personnel who are part of the Emergency Command structure should be trained for incident management pursuant to the Australasian Inter-service Incident Management System (AIIMS). This will ensure that GDF Suez personnel providing assistance to the CFA in firefighting within the mine are working in the most collaborative and complementary way.

The Victorian Government submitted that it is considering various reforms to emergency management planning, in light of the recent Hazelwood mine fire. These reforms will aim to better facilitate a consistent response across both public and privately owned land, to better cater for complex land use, and to take account of the diverse hazards of specific industries and facilities, like the Hazelwood mine. The Board affirms the Victorian Government's commitment to improve the State's planning framework for emergencies.[135]

Further reforms that the Victorian Government has committed to, relate specifically to integration of emergency planning and management with the coal mining sector. The Board affirms the commitments of the Victorian Government to:

- improve its engagement with the coal mining sector regarding emergency management plans[136]
- improve integration of industry in response to an emergency.[137]

The Board affirms GDF Suez's commitment to:

- establish an emergency command structure at the mine to deal with extreme fire danger days whenever they arise and nominate a pool of candidates who are able to act in these roles when required
- assign, in advance, particular roles under that emergency command structure to personnel selected from that pool of candidates to act in these roles on site
- notify the CFA of the identity and contact details of the personnel holding these roles
- provide more training to personnel who are intended to perform a role under the emergency command structure.[138]

WATER SUPPLY

The suppression of fires in the mine was severely hampered by the limited reticulated water supply in the northern, eastern and south-eastern batters. The Board heard evidence that the reticulated fire services water system was expanded significantly during firefighting efforts to enable the system to operate in the northern, eastern and south-eastern batters and the mine floor. This enhanced the firefighting efforts of the CFA and mine personnel, and played a significant role in suppressing the fire.

PHASE THREE: 18 FEBRUARY–25 MARCH 2014

The Board heard expert evidence from Professor Cliff. Professor Cliff acknowledged the difficulties in suppressing brown coal fires, which include the removal of the fuel, removal of the heat, isolation of the air supply and stopping chemical oxidation reactions from occurring. Professor Cliff reported to the Board that there were several methodologies that could be used to suppress fire in brown coal fires, including water, foam, helicopter water bombing and removing the coal on fire, but that there were potential weaknesses with all of these methods.[139]

The Board acknowledges that an effective suppression strategy was developed to extinguish a huge fire with an unlimited supply of fuel on or about 18 February 2014. This strategy addressed the knowledge gap of GDF Suez and fire services around best practice brown coal mine firefighting.

Accordingly, the Board commends those who developed and implemented the new suppression strategy so that the fire was eventually controlled when it was.

However, the Board considers that both fire services and GDF Suez have a lack of readily available equipment, such as compressed air foam systems, relevant to best practice brown coal mine firefighting. Both GDF Suez and fire services recognise that acquisition of best available technology for firefighting in coal mines is an area in need of improvement.[140]

The Incident Management Team's careful planning for forecast 'spike' days, in particular 25 February 2014, prevented the fire spreading from the open cut into critical infrastructure of the Hazelwood mine, including the operational parts of the mine, the coal bunker and the power station. The Board commends those efforts.

RECOMMENDATION 2

The State establish, for any future incident, integrated incident management teams with GDF Suez and other Victorian essential industry providers, to:

- require that emergency services personnel work with GDF Suez and other appropriate essential industry providers; and
- implement the Australasian Inter-service Incident Management System.

RECOMMENDATION 13

GDF Suez revise its Emergency Response Plan to:

- require an increased state of readiness on days of Total Fire Ban;
- require pre-establishment of an Emergency Command Centre;
- require pre-positioning of an accredited Incident Controller as Emergency Commander; and
- require any persons nominated as Emergency Commander to have incident controller accreditation and proficiency in the use of the Australasian Inter-service Incident Management System.

RECOMMENDATION 14

GDF Suez establish enhanced back-up power supply arrangements that do not depend wholly on mains power, to:

- ensure that the Emergency Command Centre can continue to operate if mains power is lost; and
- ensure that the reticulated fire services water system can operate with minimal disruption if mains power is lost.

1. *Country Fire Authority Act 1958* (Vic), s. 20
2. *Country Fire Authority Act 1958* (Vic), s. 3
3. Exhibit 1 – Statement of Craig Lapsley, para. 185
4. Exhibit 1 – Statement of Craig Lapsley, paras 181, 182 & 184
5. Exhibit 8 – Statement of James Mauger, para. 34; Exhibit 7 – Statement of David Shanahan, paras 47 & 48
6. Exhibit 8 – Statement of James Mauger, paras 34 & 35
7. Exhibit 8 – Statement of James Mauger, para. 35
8. Prezioso T362:24 – T363:11
9. Roach T646:4-17
10. Roach T646:26-31; T647:1-10
11. Exhibit 25 – Log of events produced by Mr Roach, p.1
12. Exhibit 25 – Police statement of Alan Roach, p.5; Roach T649:14-22
13. Exhibit 7 – Statement of David Shanahan, paras 59 & 60
14. Exhibit 7 – Statement of David Shanahan, paras 60-62
15. Shanahan T268:2-16
16. Exhibit 7 – Statement of David Shanahan, paras 62, 66 & 68
17. Shanahan T268:20-25
18. Prezioso T365:11-28
19. Exhibit 13 – Statement of Robert Dugan, annexure 11
20. Exhibit 13 – Statement of Robert Dugan, paras 17-18
21. Roach T649:21 – T650:15
22. Exhibit 8 – Statement of James Mauger, para. 36
23. Exhibit 8 – Statement of James Mauger, para. 37
24. Exhibit 29 – Second statement of Steven Harkins, para. 57
25. Exhibit 10 – Statement of Steven Harkins, para. 64
26. Exhibit 10 – Statement of Steven Harkins, para. 65
27. Exhibit 7 – Statement of David Shanahan, para. 67; Exhibit 8 – Statement of James Mauger, paras 39 & 41
28. Jeremiah T485:9-20; Exhibit 1 – Statement of Craig Lapsley, para. 81
29. Exhibit 8 – Statement of James Mauger, para. 40
30. Exhibit 8 – Statement of James Mauger, para. 43
31. Exhibit 7 – Statement of David Shanahan, para. 69
32. Exhibit 58 – Third statement of Steven Harkins, para. 4
33. Prezioso T369:1-11; T369:21-28
34. Prezioso T368:18 – T369:11
35. Prezioso T369:28 – T370:10
36. Exhibit 25 – Log of events produced by Mr Roach; Roach T652:22 - T653:7
37. Exhibit 25 – Police statement of Alan Roach, p. 8
38. Exhibit 7 – Statement of David Shanahan, para. 85
39. Exhibit 10 – Statement of Steven Harkins, para. 90; Exhibit 25 – Police statement of Alan Roach, p. 8
40. Exhibit 10 – Statement of Steven Harkins, paras 90 & 91
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42. Prezioso T372:10-11
43. Faithful T389:2 – T390:1
44. Exhibit 7 – Statement of David Shanahan, para. 86
45. Prezioso T374:18-31
46. Exhibit 7 – Statement of David Shanahan, paras 87-89
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48. Exhibit 14 – Statement of Anthony Lalor, paras 14-17
49. Exhibit 14 – Statement of Anthony Lalor, paras 13, 18 & 19
50. Exhibit 58 – Third statement of Steven Harkins, para. 4; Exhibit 10 – Statement of Steven Harkins, para. 97
51. Exhibit 7 – Statement of David Shanahan, para. 94
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55. Exhibit 1 – Statement of Craig Lapsley, para. 95
56. Exhibit 1 – Statement of Craig Lapsley, paras 96-99
57. The Cowwar brigade is located approximately 40 kilometres north-east from Morwell
58. Exhibit 24 – Statement of Doug Steley, paras 8, 10, 23, 24 & 31
59. Exhibit 14 – Statement of Anthony Lalor, para. 26

60. Exhibit 10 – Statement of Steven Harkins, para. 96
61. Exhibit 7 – Statement of David Shanahan, para. 102
62. Exhibit 10 – Statement of Steven Harkins, paras 95, 100-102
63. Exhibit 1 – Statement of Craig Lapsley, para. 98 attachment, Incident Action Plan for 9 February 2014 (CFA.0007.001.0001)
64. Exhibit 10 – Statement of Steven Harkins, annexure 14
65. Exhibit 10 – Statement of Steven Harkins, para. 11(g)
66. Exhibit 24 – Statement of Doug Steley, para. 22
67. Exhibit 1 – Statement of Craig Lapsley, para.104
68. Exhibit 16 – Incident Shift Plan for 10 February 2014
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71. Exhibit 1 – Statement of Craig Lapsley, para. 104; Exhibit 84 – Statement of Steven Warrington, para. 19
72. Exhibit 84 – Statement of Steven Warrington, paras 27 & 28
73. Exhibit 84 – Statement of Steven Warrington, paras 22-24 & 30
74. Exhibit 1 – Statement of Craig Lapsley, para. 107
75. Exhibit 1 – Statement of Craig Lapsley, para. 111
76. Adapted from Exhibit 1 – Statement of Craig Lapsley, para. 111 attachment, State Strategic Support Team Brief – Latrobe Valley Coal Mine (FSC.0006.005.0067)
77. Exhibit 7 – Statement of David Shanahan, para. 106; Shanahan T249:22-25; T254:3-8
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81. Exhibit 13 – Statement of Robert Dugan, para. 52
82. Exhibit 13 – Statement of Robert Dugan, para. 55
83. Exhibit 13 – Statement of Robert Dugan, paras 50 & 51
84. Exhibit 1 – Statement of Craig Lapsley, para. 128
85. Victorian Government Documents, 23 April 2014, Emergency Management Manual Victoria Part 7 (DOJ.0001.001.0102)
86. Exhibit 13 – Statement of Robert Dugan, paras 63-66; Exhibit 19 – Statement of Barry Foss, paras 13 & 14
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105. Exhibit 22 – Statement of Robert Barry, paras 3, 6 & 7
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116. Exhibit 22 – Statement of Robert Barry, para. 16.2
117. Exhibit 99 – Hazelwood mine fire infra-red line scan from 11 February, 18 February, 28 February and 9 March 2014
118. Exhibit 1 – Statement of Craig Lapsley, para. 139

119. Exhibit 13 – Statement of Robert Dugan, paras 76 & 77
120. Exhibit 1 – Statement of Craig Lapsley, para. 99
121. Exhibit 1 – Statement of Craig Lapsley, para. 100
122. Exhibit 1 – Statement of Craig Lapsley, para. 100
123. Written submission of GDF Suez,18 June 2014, para. 101
124. Exhibit 92 – Expert report of Roderic Incoll, paras 210 & 218; Exhibit 91 – Expert report of David Cliff, p. 15
125. Exhibit 91 – Expert report of David Cliff, pp. 6-7
126. Exhibit 92 – Expert report of Roderic Incoll, para. 265; Incoll T2167:11-24
127. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements
128. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements
129. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements
130. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements
131. Written submission of GDF Suez, 18 June 2014, paras 101, 102 & 110
132. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements
133. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements; Graham T2245:12 – T2247:3
134. Exhibit 1 – Statement of Craig Lapsley, paras 207 & 228
135. Second written submission of the Victorian Government, 18 June 2014, paras 4.10 & 4.11
136. Second written submission of the Victorian Government, 18 June 2014, paras 4.14 & 4.16
137. Second written submission of the Victorian Government, 18 June 2014, paras 4.19 & 4.20
138. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements
139. Exhibit 91 – Expert report of David Cliff, pp. 6 & 7
140. Exhibit 1 – Statement of Craig Lapsley, para. 138.6; Written submission of GDF Suez, 18 June 2014, paras 130-136

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PART THREE FIRE RISK MANAGEMENT

3.1 Regulation of fire risk in the Latrobe Valley
3.2 Regulation of fire risk at the Hazelwood mine
3.3 Fire prevention and mitigation measures taken by GDF Suez

3.1 REGULATION OF FIRE RISK IN THE LATROBE VALLEY

OVERVIEW

Under its Terms of Reference, the Board of Inquiry has been asked to inquire into and report on the adequacy and effectiveness of regulatory regimes to manage the risk of fire. This Chapter describes the regulatory regimes in place to reduce or mitigate the risk of fire in the Latrobe Valley at the regional and local planning level. Further chapters explore the regulation of fire risk at the Hazelwood mine, and the fire prevention and mitigation measures taken by GDF Suez.

The regulation of fire risk in the general landscape occurs through the implementation of land use planning schemes and integrated emergency management planning, of which integrated fire management planning is a part. A purpose of planning systems is to manage a range of land uses and a broad range of emergencies, including the risk of fire.

Existing land use in the Latrobe Valley poses some challenges for the mitigation of fire risk. For example, timber plantations and other fire fuel in the landscape can contribute to the risk of fire.

The Board heard evidence from the Latrobe City Council and received submissions from timber plantation owners in the vicinity of the mine. Independent expert, Mr Roderic Incoll, Bushfire Risk Consultant, also provided evidence on the fire risk of timber plantations and other fire fuel in the areas surrounding the Hazelwood mine.

The implementation and effectiveness of integrated fire management planning was the subject of evidence from the Fire Services Commissioner as well as the Latrobe City Council Coordinator of Emergency Management. Other witnesses from government agencies and the Council also provided evidence on this issue.

The Board acknowledges that the Latrobe City Council has inherited land use planning decisions that have resulted in a significant gap between the fire protection policies and strategies outlined in the Latrobe Planning Scheme and the reality of land use in the vicinity of the Hazelwood mine.

The Board concludes that timber plantations established in close proximity to an open cut coal mine should not be developed without consideration of fire risk management. Further, it is not appropriate to extend an open cut coal mine towards existing timber plantations without a review taking place in relation to fire risk. The Board concludes that there is considerable scope for improvement in the way that land use planning in the Latrobe Valley manages the risk of fire, particularly in the vicinity of open cut coal mines.

The Board considers that the Minister for Planning, advised by the Department of Transport, Planning and Local Infrastructure, and the Latrobe City Council, should investigate amending the Latrobe Planning Scheme. The purpose of amendments would be to ensure, so far as is reasonably practicable, that the risk of embers from external rural fires (in particular from timber plantations) entering open cut coal mines in the Latrobe Valley, is minimised. This should occur as part of the regular review of the Latrobe Planning Scheme that is due to be completed in 2014.

At the municipal level, the Board is concerned that whilst integrated fire management plans have been prepared, their implementation is of limited practical impact, as there has been minimal involvement by the Hazelwood mine and other essential industry groups in the development of the plans. Further, it is unclear how plans are to be managed at both municipal and regional level when it appears that the content of the plans, including the treatment of risks, is not known to the agencies that have oversight in those areas. Without an approach that involves the active engagement of all relevant entities, integrated fire management plans will not be adequate or effective.

The Board concludes that fundamental weaknesses exist with respect to the adequacy and implementation of integrated fire management planning, which must be addressed if the concept is to be effective.

The Board accepts and endorses the evidence of the Fire Services Commissioner that legislation needs to be implemented to give greater force to integrated fire management planning, and to clarify who is responsible for implementation of the plans.

FIRE RISK REGULATION

There is no single entity responsible for fire prevention and risk mitigation. As fire does not discriminate, there is no logic in planning separately for fire prevention in different land tenures (Esplin, Gill & Enright, 2003, p. 139).

The government, community and industry all have a role to play in preventing and reducing the risk of fire in the Latrobe Valley and elsewhere.

The final report of the 2009 Victorian Bushfires Royal Commission explained the notion of shared responsibility for Victorian fire management, which is now reflected in both national and state emergency policy:

> The Commission uses the expression "shared responsibility" to mean increased responsibility for all. It recommends that state agencies and municipal councils adopt increased or improved protective, emergency management and advisory roles. In turn, communities, individuals and households need to take greater responsibility for their own safety and to act on advice and other cues given to them before and on the day of a bushfire (Teague, McLeod & Pascoe, 2010, p. 6).

Regulatory mechanisms in place to prevent fire include land use planning, municipal fire prevention and integrated fire management planning.

LAND USE PLANNING

The 2009 Victorian Bushfires Royal Commission identified land use planning as an important measure for reducing bushfire risk:

> Many have argued that planning regulation is crucial; for example, the 2004 report of the National Inquiry on Bushfire Mitigation and Management cited land-use planning as 'the single most important mitigation measure in preventing future disaster losses in areas of new development'… planning decisions in relation to settlement matters, land use and development, and the location of individual buildings on a property can potentially reduce bushfire risk by, among other things, restricting development in the areas of highest risk, where people's lives may be gravely endangered in the event of extreme bushfire (Teague, McLeod, & Pascoe, 2010, Vol. II, p. 214).

The Commission also noted the inherent limitations of land use planning measures, which seek to reduce risk in the long-term, operate prospectively and have little capacity to deal with past decisions in relation to existing uses of land (Teague, McLeod, & Pascoe, 2010, Vol. II, p. 214).

Land use planning in Victoria is regulated by the *Planning and Environment Act 1987* (Vic) (Planning and Environment Act). Strategic planning is undertaken by planning authorities using a set of standard state-wide planning provisions called the Victorian Planning Provisions to create local planning schemes. Responsible authorities make decisions about the use and development of land in accordance with the permit application process set out in the Planning and Environment Act, with reference to planning scheme controls.

Section 1 of the Planning and Environment Act establishes 'a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.' The Minister for Planning administers the Planning and Environment Act with support from the Department of Transport, Planning and Local Infrastructure (DTPLI). The Minister has various roles under Part 1A of the Act, including the central role of preparing and amending the Victorian Planning Provisions.

The Victorian Planning Provisions comprise:

- the State Planning Policy Framework
- a set of zones and overlays used by each council to construct the planning scheme for its municipality
- particular provisions
- general provisions
- definitions
- documents that apply consistently across all planning schemes.

The State Planning Policy Framework sets out general principles of land use and development planning in relation to settlement, environmental and landscape values, environmental risk, natural resource management, built environment and heritage, housing, economic development, transport and infrastructure.[1] The Environmental Risk Policy in the State Planning Policy Framework specifically requires consideration of the risk of bushfire, and establishes broad strategies for strengthening community resilience to bushfire.[2]

The Victorian Planning Provisions contain a set of standard zones that may be applied by councils to land in their municipal district. These zones determine the ways in which particular land may and may not be used and developed. Within each zone, some uses of land exist 'as of right', some uses require a permit, and there are some prohibited uses. Some land falls under an 'existing use', which means that if it has been used for a particular purpose for a period of 15 years and that use was lawful at the outset, it becomes exempt from the zone requirements.[3] The zones in the Victorian Planning Provisions are grouped as residential, industrial, commercial, rural, public land and special purpose zones.[4]

Overlays are a further layer of planning controls that may be applied by councils to land. A standard set of overlays is contained in the Victorian Planning Provisions. Overlays focus more on requirements for the development of land than on the uses to which it may be put, and more than one overlay may be applied to a given parcel of land. The overlays in the Victorian Planning Provisions are grouped as environment and landscape overlays, heritage and built form overlays, land management overlays, and 'other overlays'.[5]

The Victorian Planning Provisions also contain a set of particular provisions that apply across planning schemes to particular uses and developments (in addition to the requirements of a zone or an overlay), and a set of general, largely administrative provisions that apply across planning schemes.

LAND USE PLANNING FOR FIRE RISK MANAGEMENT IN THE LATROBE VALLEY

Pursuant to s. 8 of the Planning and Environment Act, the Minister may prepare a planning scheme for any area of Victoria. The Latrobe City Council is the planning authority for the Latrobe Planning Scheme.[6] The Council may only amend its planning scheme with the authorisation of the Minister.[7]

Under ss. 13 and 14 of the Planning and Environment Act, a 'responsible authority' is the person responsible for the administration and enforcement of a planning scheme. In its capacity as a responsible authority, the Latrobe City Council sets zone and overlay controls for land use and decides applications for permits for the use and development of land within its municipal district.[8]

The Latrobe Planning Scheme comprises both the Victorian Planning Provisions and local planning provisions established by the Latrobe City Council. The Local Planning Policy Framework sets out the Council's vision for the municipality, and its broad land use planning policies. Two aspects of the Latrobe Local Planning Policy Framework are of particular relevance to this Inquiry.

The first aspect is 'Natural Environment Sustainability' under cl. 21.03, which contains a number of objectives, one of which is bushfire risk management. Clause 21.03-8 titled 'Wildfire Overview' identifies two objectives – to ensure that new land use and development does not increase the level of fire risk; and to ensure that new land use and development includes adequate fire protection measures.[9] Implementation of these objectives, and the strategies that support them, is achieved by applying relevant overlays, in particular the 'Environmental Significance Overlay–Schedule 1 Urban Buffers', and the 'Bushfire Management Overlay'. These overlays are discussed in more detail below.

The second aspect is 'Economic Sustainability' under cl. 21.07, which acknowledges linkages between the natural environment and the economy—namely that natural resources, such as coal, timber and farmland, help drive the local economy. Clause 21.07-3 identifies the following key issues relevant to coal as an economic resource:

- the significance of the Gippsland Coalfields Policy Area in providing, directly or indirectly, the major proportion of Victoria's energy supplies, in the form of brown coal
- the presence of established communities, including the urban settlements of Latrobe City, as a networked urban system
- the significance of fire as a major hazard to people, plant and equipment employed in the mining of brown coal, and the major consequences arising from interruption to the electricity supply
- the importance of established agricultural activity
- the water resource, both surface and underground, to the quality of the regional water catchment
- the profound effect of major industries on the physical and social environment of the municipality
- the need for cooperation between all levels of government, the private sector and the community, and the importance of the adequate recognition of all sectors in decision making for the region.[10]

Clause 21.07-4 provides for coal buffers, of between 750 and 1,000 metres, between urban development and existing and future coal resource development. An objective of the coal buffer is to provide for uses and developments within the buffer area that are compatible with coal development. A strategy to achieve this is to ensure the management, use or development of land in all buffer areas minimises the potential fire risk to open cut mining.[11]

The Hazelwood mine and most of the land that surrounds it is zoned 'Special Use Zone–Schedule 1–Brown Coal (SUZ1)'. The primary purpose of SUZ1 is to provide for brown coal mining, electricity generation and associated uses. The secondary purpose of SUZ1 is to allow for interim non-urban uses that will protect brown coal resources and discourage the use or development of land that is incompatible with future mining and industry. Dwellings are allowed within SUZ1 in restricted circumstances only.[12]

The 'as of right' land uses specified under SUZ1 stipulate that a buffer zone of at least 1,000 metres between coal mining and related uses, and a residential zone, a business zone and land used for a hospital or a school, is required.[13] However, the Latrobe City Council is not able to enforce this buffer zone within a mine licence boundary. Under cl. 52.08 of the Victorian Planning Provisions (titled 'Earth and Energy Resources Industry'), no permit is required to use or develop land for mineral extraction licensed under the *Mineral Resources (Sustainable Development) Act 1990* (Vic) (Mineral Resources Act). This exemption reflects s.42 of the Mineral Resources Act.[14] The practical effect of these provisions is that the Mining Regulator (the Earth Resources Regulation Branch of the Department of State Development, Business and Innovation), not the Latrobe City Council, is the relevant authority in relation to the use and development of land within the Hazelwood mine boundaries.

The Latrobe Planning Scheme applies two overlays that assist in managing fire risk.

The first is an 'Environmental Significance Overlay–Schedule 1–Urban Buffer (ESO1)' under cl. 42.01.[15] This overlay is applied to areas around the Hazelwood mine to implement the policy on coal buffers. An application for any proposed development within 1,000 metres of a mining licence must be accompanied by a fire management plan.[16]

The second is a 'Bushfire Management Overlay' under cl. 44.06, which is applied to identify bushfire prone land within Latrobe City. The Bushfire Management Overlay aims to ensure that the location, design and construction of development considers the need to implement bushfire protection measures, and to ensure that development does not proceed unless the risk to life and property from bushfire can be reduced to an acceptable level.[17]

The Latrobe Planning Scheme must be reviewed every four years. A review is due to be completed in 2014. The Minister for Planning must approve any changes under the planning scheme.[18]

TIMBER PLANTATIONS

The Board's attention was drawn to the existence of several timber plantations to the west and south of the Hazelwood mine. In a landscape that has largely been cleared of native vegetation, timber plantations are a potential source of fuel for a bushfire and can create embers that are carried long distances.[19]

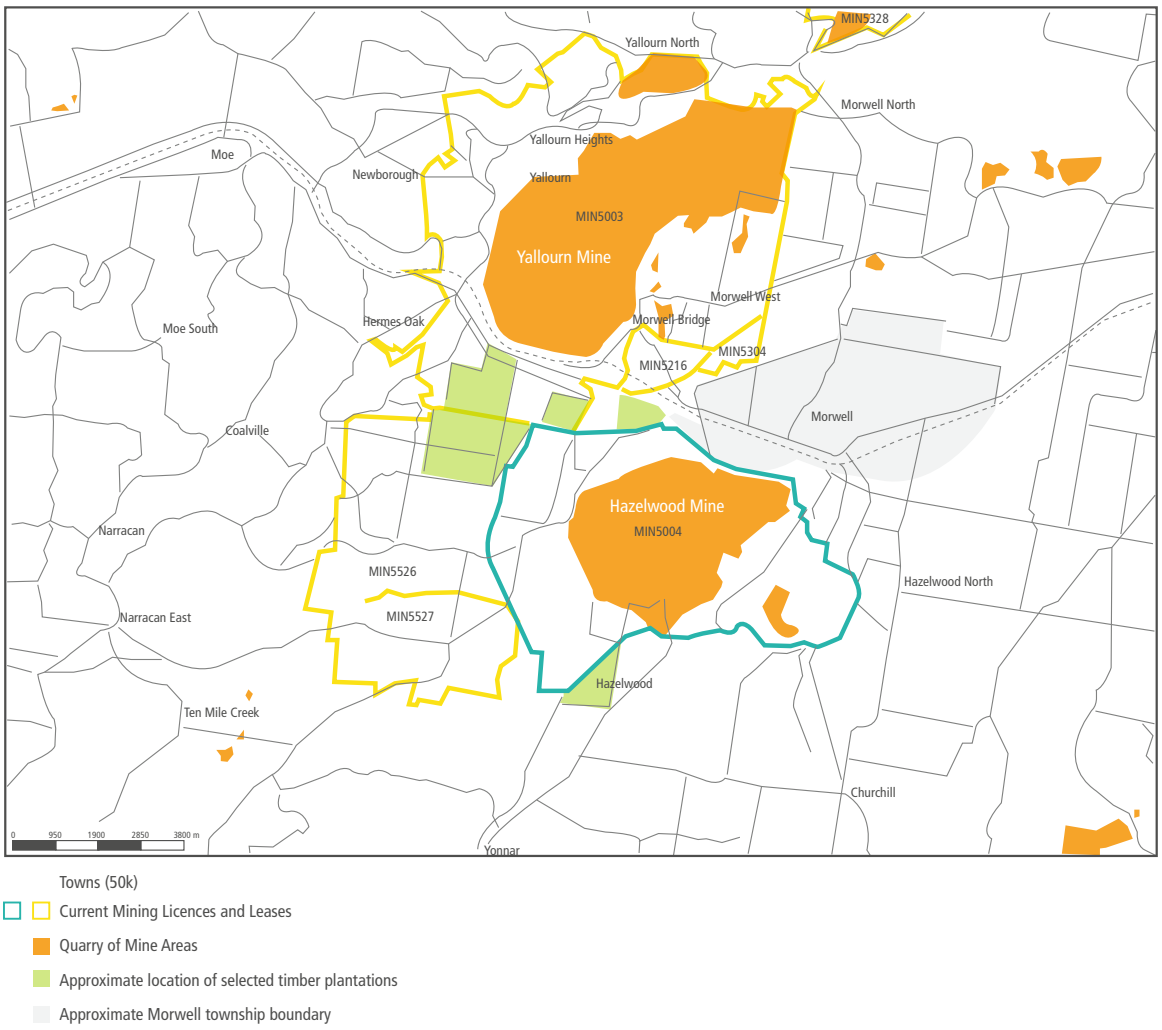
The Latrobe Planning Scheme addresses the coexistence of timber production with the development and use of the coal resource in several ways. The Latrobe Local Planning Policy Framework adopts overall strategies to:

- ensure that timber production is planned in a manner which will complement the orderly development of the coal resource
- ensure that timber production takes into account the need for effective fire protection for the coal resource
- give timber production a lesser priority than the extraction of coal and agricultural land use activity unless a proper economic assessment shows it to be viable.[20]

Further, SUZ1 requires a permit for timber plantations within 1,000 metres of land covered by a mining licence. Before deciding on an application for such a permit, the Council must ensure that there are measures in place to address fire risk, particularly in the vicinity of a brown coal mine.[21]

Mr Jason Pullman, Latrobe City Council Coordinator of Strategic Planning, told the Board that currently there are three timber plantations within 1,000 metres of the Hazelwood mine (see Figure 3.1).

Figure 3.1 Location of mining licences and selected timber plantations near the Hazelwood mine[22]



Two of these plantations, to the west and the south-west of the mine, are on land zoned SUZ1 and are owned by Hancock Victorian Plantations Pty Ltd (HVP). The third plantation, to the north-west of the mine, is on land in the Public Use Zone and is owned by Gippsland Water. Although the Latrobe Planning Scheme would require a permit for these timber plantations if they were established today, Latrobe City Council has no record of issuing a permit for any of them.[23]

The Board received a submission from HVP which confirmed that it owns two timber plantations in close proximity to the Hazelwood mine—the Narracan Plantation to the west of the mine and the Hazelwood Plantation to the south-west—and that it does not hold a planning permit for either plantation. Both plantations were established in about 2001, at a time when they were not owned by HVP. The Narracan Plantation was acquired by Australian Paper Plantations Pty Ltd, as part of a land swap with Hazelwood Power. The Hazelwood Plantation was initially acquired by Australian Paper Plantations as part of a land swap with the Victorian Government. The title to both plantations contains a restriction that the land only be used for the growing of hardwood timber plantations. HVP's understanding when it acquired both titles was that if permits were required and did not exist, the land enjoyed existing use rights.[24]

Gippsland Water submitted to the Board that it owns land to the north-west of the Hazelwood mine, and that it leases part of that land to Generation Victoria, trading as Ecogen Energy, for the purpose of planting, maintaining and harvesting Tasmanian Blue Gums. The plantation was first planted in 1998. Gippsland Water confirmed that it does not hold a planning permit to use the land for timber production.

Gippsland Water told the Board that in May 1998 the Latrobe Shire Council advised Ecogen Energy that a permit was not required.[25]

GDF Suez provided evidence to the Board that in May 1998, Hazelwood Power (as it was then known) wrote to Gippsland Water raising concerns about the proposed establishment of the plantation on its land, due to 'the significant fuel source this would represent in time of bushfire conditions'; the fact that 'the proposed plantation is well within recognised distances of fire "spotting"'; and the proximity of the plantation to the Hazelwood mine.[26] Hazelwood Power's concerns were apparently alleviated after a meeting with Ecogen Energy, also attended by a County Fire Authority (CFA) Risk Manager, at which Ecogen Energy agreed to develop a fire management plan for the plantation.[27]

Hazelwood Power also corresponded with Australian Paper Plantations in 2000 about the fire risk posed by eucalypt plantations. GDF Suez provided the Board with a letter from Australian Paper Plantations dated 7 January 2000, which assured Hazelwood Power of its good fire prevention and suppression record.[28]

All three timber plantations were well established by 2009, when GDF Suez obtained a variation of its work plan to extend the Hazelwood mine to the west.[29] A complex approval process preceded the work plan variation. The process included a panel hearing in 2005 to assess an environmental effects statement and the proposed amendment of the Latrobe Planning Scheme.[30] There is no indication in the evidence before the Board that the proximity of the timber plantations to the proposed new west field of the Hazelwood mine was raised as a consideration in this approval process.[31] Evidently the existence of the plantations did not deter GDF Suez from seeking to extend the mine towards them, or necessary approvals being given.

Independent expert, Mr Roderic Incoll, Bushfire Risk Consultant, advised the Board that he was not confident with the advice received by the mine in 1998 that the risk of fire from the plantations to the north-west of the mine could be appropriately managed. In Mr Incoll's opinion, the proximity of these plantations to the mine represents a 'significant planning failure', and the plantations are a potential source of embers that could cause a similar event to the mine fire that occurred on 9 February 2014.[32]

Mr Incoll stated:

> The presence of eucalypt plantations in the north-to-south-west proximity of the Mine, while in conformity with the planning rules, provides a ready source of firebrands [embers] under high fire danger weather conditions…Significant quantities of suspended bark fuel capable of forming firebrands [embers] that could be propelled into the Mine under fire conditions are present and obvious in eucalypt plantations west of the mine…This is not novel or unusual and in my opinion amounts to a foreseeable risk…This is an issue that is not effectively addressed by the mine fire policy framework or necessarily by the local planning rules.[33]

Mr Incoll identified the proximity of these plantations to the mine in Figure 3.2.

Figure 3.2 Distance of established eucalypt plantations from Hazelwood mine[34]

HVP acknowledged that during a bushfire, fire spotting is likely to arise from all types of eucalypts. However, HVP submitted that the risk of generating burning embers and igniting spot fires varies markedly, and that young eucalypts in plantations present a significantly lower risk than do mature eucalypts in unmanaged stands.[35]

The fact of other sources of fire spotting in the vicinity of the mine was acknowledged by Mr Incoll who noted that:

> …even if the plantations could be removed by the wave of a magic wand, there are numerous windbreaks and belts of remnant roadside vegetation within spotting distance on freehold rural land that would still pose an (albeit reduced) hazard to the Hazelwood Mine operations during the passage of high intensity rural fires.[36]

MUNICIPAL FIRE PREVENTION

MUNICIPAL FIRE MANAGEMENT

Section 55A of the *Country Fire Authority Act 1958* (Vic) (CFA Act) requires each municipal council to prepare a municipal fire prevention plan. The municipal fire prevention plan must identify the areas within the municipality that are at particular risk of fire, and address the treatment of those risks, including assigning responsibility for treating the risks. Pursuant to s. 54 of the CFA Act, the CFA has the power to appoint a regional fire prevention committee for each of the CFA regions. This committee must consist of members from the local CFA brigades, any industry brigades, and representatives from the municipal council, including the fire protection officer. A purpose of the committee is to advise and assist the municipal council in preparing a municipal fire prevention plan.[37]

The Latrobe City Council Municipal Fire Prevention Plan October 2011 was prepared by Mr Lance King, Latrobe City Council Coordinator of Emergency Management, with input from numerous stakeholders, including International Power (Hazelwood).[38] Authorities and organisations in the municipality that had their own fire plans were listed in this Municipal Fire Prevention Plan.[39]

The Municipal Fire Prevention Plan has since been superseded as a result of the introduction of Integrated Fire Management Planning (discussed below).

In addition to fire planning, s. 43 of the CFA Act imposes a duty on every municipal council and public authority to take all reasonable steps to prevent the occurrence of fires, and minimise the damage of the spread of fires, on and from any land vested in it or under its control or management, and any road under its control or management. The Hazelwood mine does not occupy land vested in or controlled by the Latrobe City Council, nor is it a public authority. The Hazelwood mine is therefore not subject to obligations under s. 43 of the CFA Act. It is however subject to s. 41 of the CFA Act, which entitles the fire prevention officer at the Latrobe City Council to serve fire prevention notices on an owner or occupier of land if there is a basis for such a notice. Under s. 41D of the CFA Act, it is an offence not to comply with such a notice.

INTEGRATED FIRE MANAGEMENT PLANNING

BACKGROUND

Integrated fire management planning was an outcome of the Report of the Inquiry into the 2002–2003 Victorian Bushfires, chaired by the then Emergency Services Commissioner, Mr Bruce Esplin (Esplin, Gill & Enright, 2003). The 2009 Victorian Bushfires Royal Commission concluded that integrated fire management planning could improve planning for fire prevention (Teague, McLeod & Pascoe, 2010, Volume 2, pp. 37-41). Integrated fire management planning requires the involvement of the community, public and private land owners, utility providers, the State, councils, and industry. By involving these parties, the characteristics of a given community can be understood and the fire risks identified can then be managed (Esplin, Gill & Enright, 2003, Ch. 14).

Mr King gave evidence to the Board that integrated fire management planning involves 'looking at more in-depth risks associated with fire on an all agencies approach including the owners of critical infrastructure.'[40] The objective of integrated fire management planning is 'to ensure a more strategic and integrated approach to fire management planning, reducing the impact of fire in Victoria and assisting in establishing a state-wide planning approach and developing processes for continuous improvement.'[41]

Section 20(1) of the *Emergency Management Act 1986* (Vic) (Emergency Management Act) provides that a municipal council must prepare and maintain a 'municipal emergency management plan' for emergency prevention, response and recovery. Preparation of the plan is by committee. Guidelines for committees are found in Part 6A of the Emergency Management Manual Victoria.

Mr Craig Lapsley, Fire Services Commissioner, gave evidence that municipal and regional plans draw linkages to other specific plans 'including agency and mine mitigation, response and recovery plans ranging from government agencies, catchment management authorities and major essential service providers/sites including the coal mines.'[42] Integrated emergency management plans are being prepared in some areas of Victoria across public and private land; however as explained by Mr Lapsley, 'this integrated approach has not addressed the interface and integration of major hazards or special hazards that would result in integrated emergency planning for facilities like the Hazelwood mine.'[43]

LATROBE CITY FIRE MANAGEMENT PLAN 2013–2016

The Latrobe City Council's Fire Management Committee has produced a Municipal Fire Management Plan (as a sub-plan of the Latrobe Municipal Emergency Management Plan).[44]

The Municipal Fire Management Plan includes fire history information, assets at risk and control measures. It addresses the Gippsland Regional Strategic Fire Management Plan and the Victorian Fire Risk Register by referencing areas and assets recognised as at risk. The Municipal Fire Management Plan treatments for protecting assets are more operational, whereas the treatments for risk protection at the regional level are more strategic.

For example, the treatments listed for managing fire risk at the Hazelwood mine in the Municipal Fire Management Plan are:

- routine asset site maintenance
- (GDF Suez/CFA) Emergency Management Plan
- on site firefighting resources
- land use planning considerations for surrounding land use.[45]

Mr King gave evidence to the Board of his concerns that there is no program in place to monitor the implementation of the Municipal Fire Management Plan and that it is unclear who is responsible for implementing the plan.[46] He indicated that he has no authority to tell any other agency what they have to do to meet the requirements of the Municipal Fire Management Plan.[47]

Mr Pullman gave evidence to the Board that despite it being part of his role, he was unaware that land use planning was listed in the Municipal Fire Management Plan as one of the treatments for the identified risk of fire in the Hazelwood mine.[48]

Mr Incoll made several observations about the interaction between the municipal fire planning and the integrated fire management planning regimes, and suggested that there is an overlap between the framework for the fire management planning under the Emergency Management Act and the long-established municipal planning process, which leads to confusion.[49] He gave the example that both legislative schemes appear to appoint the same municipal officer in two roles, which are for all intents and purposes, the same role.[50] He stated that the overlap and confusion must be resolved to ensure that fire prevention planning can be implemented effectively.[51]

Another criticism expressed by Mr Incoll was that there is no interface between Emergency Management protocols and fire preparedness of the Hazelwood mine.[52] Mr Incoll noted that whilst there were opportunities for communications between the Latrobe City Council and organisations affected by fire in the region, the Municipal Fire Management Plan did not influence or interface with the fire planning at the Hazelwood mine because the mine is outside the jurisdiction of s. 43 of the CFA Act.[53]

Mr Incoll stated that 'the lack of regulatory emphasis of fire protection is remarkable, given the proximity of the residential area of Morwell, the flammable nature of brown coal and the extensive previous fire experience in this Mine and Yallourn Open Cut.'[54]

Mr Incoll was also concerned that there is no enabling legislation that compels implementation of fire management plans.[55]

Mr Lapsley acknowledged that there were frustrations at municipal level with respect to the planning, resourcing and implementation of Municipal Fire Management, and that the legislation needed to be modernised to give consequences to the planning and to provide a specific statutory requirement for municipal fire management planning across the State.[56]

GIPPSLAND REGIONAL STRATEGIC FIRE MANAGEMENT PLAN

The Gippsland Regional Strategic Fire Management Plan was prepared by the Regional Strategic Fire Management Planning Committee with input from multiple stakeholders, in accordance with the principles of the 2007 Integrated Fire Management Planning Framework.[57] The Plan was created under s. 9 of the Emergency Management Act.[58] It details a range of fire mitigation activities and bodies accountable for delivering those activities.

In the last 14 months, each of the eight government regions in Victoria have for the first time, prepared a regional strategic plan.[59]

The Gippsland Regional Strategic Fire Management Plan identifies and prioritises assets and risk across the Gippsland region. It categorises 'Power Generation Facilities – coal mines' (which would include Hazelwood Power Station and mine) as an extreme risk.[60] Attachment A of the Gippsland Regional Strategic Fire Management Plan identifies 'Power general facilities – coal mines' as an asset, and notes that fire from external fire events has the potential to disrupt power supplies to the national grid.

The treatments for the risk are identified in Attachment A of the Plan as:

- legislative controls including MHF (major hazard facility)
- emergency management plans
- CFA pre-incident plans
- on site firefighting resources
- 'DPI regulatory planning'.[61]

Land use planning considerations for surrounding land use is listed as a 'treatment recommendation'.[62]

Some issues were raised with the Board concerning the suitability of the Gippsland Regional Strategic Fire Management Plan.

First, the reference to 'MHF' is a reference to a 'major hazard facility' within the meaning of Part 5.2 of the Occupational Health and Safety Regulations 2007 (Vic) (OHS Regulations). Mr Leonard Neist, Executive Director of the Health and Safety Division at Victorian WorkCover Authority (VWA), gave evidence that the Hazelwood mine is not a 'MHF'.[63] Mr Lapsley told the Board that the reference in the Gippsland Regional Strategic Fire Management Plan to 'MHF' is 'incorrect for that site'.[64]

Second, the evidence before the Board was that several of the parties who are required to implement these controls or treatments are either incorrectly described or were not aware of the actions expected of them. For example, the treatment 'DPI regulatory planning' refers to the Department of Primary Industries, a past regulator of the mine. The current regulators of the mine, the Mining Regulator and VWA, told the Board that they were not aware that they had a responsibility to implement any action for the mitigation of fire risk at the Hazelwood mine as set out the Fire Management Plan.[65] The role of these regulatory bodies in the mitigation of fire at the Hazelwood mine is discussed more generally in Chapter 3.2 Regulation of fire risk in the Hazelwood mine.

Third, as noted above, Mr Pullman was not even aware that 'land use planning' was listed as a treatment of the risk of fire to the Hazelwood mine.[66]

Mr Lapsley accepted that the existing treatments in the Gippsland Regional Strategic Fire Management Plan were 'pretty thin', and identified other problems with integrated fire management planning as it currently operates.[67]

DISCUSSION AND CONCLUSIONS

LAND USE PLANNING

The Latrobe Valley has inherited land use planning decisions that have resulted in a significant gap between the fire protection policies and strategies outlined in the Latrobe Planning Scheme and the reality of land use in the vicinity of the mine.

Most notably, there is no buffer zone between the Hazelwood mine and the town of Morwell. The provisions of the Latrobe Planning Scheme that require a buffer zone of between 750 and 1,000 metres around a coal mine post-date the approval (in the 1940s) of a new open cut mine adjacent to Morwell. The Latrobe City Council is powerless to enforce this buffer zone within the boundaries of the mine licence.

In addition, there are three timber plantations within 1,000 metres of the mine licence area, each capable of catching fire and throwing embers into the Hazelwood mine. Although the Latrobe Planning Scheme currently provides that a permit is required for timber plantations this close to the mine, for historical reasons and other reasons that are difficult to remedy, each of these plantations operates without a permit.

GDF Suez submitted that the establishment of timber plantations close to the Hazelwood mine represented a 'fundamental failure in appropriate land use planning in the Valley.'[68] Information subsequently provided to the Board by the plantation owners paints a more complex picture in relation to both the establishment of the plantations and the risk they pose. These plantations do not represent the entire potential source of embers spotting into the mine. Other sources include trees and other vegetation, grasslands and trees planted on roads, and nearby rural land.

The Board was unable to assess the relative fire risk posed by eucalypt plantations and remnant vegetation containing mature trees. It accepts that both contribute to the risk of a bushfire spreading into an open cut coal mine such as the Hazelwood mine. As Mr Incoll observed, even if the plantations could be removed 'by the wave of a magic wand', there are numerous windbreaks and belts of remnant roadside vegetation within spotting distance that still pose a hazard during the passage of high intensity rural fires.[69]

The Board agrees that it is not desirable that timber plantations be established in close proximity to an open cut coal mine without consideration of fire risk management, nor is it appropriate to extend an open cut coal mine towards existing timber plantations, apparently without regard to fire risk. There is considerable scope for improvement in the way that land use planning in the Latrobe Valley manages the risk of fire, particularly in the vicinity of open cut coal mines. The Board endorses the observations of Mr Lapsley that fire management needs to be 'front and centre' in land use planning decisions.[70]

The Board considers that the Minister for Planning, advised by the Department of Transport Planning and Local Infrastructure and the Latrobe City Council, should investigate amending the Latrobe Planning Scheme to ensure that, so far as is reasonably practicable, it minimises the risk of embers from external rural fires, in particular in timber plantations, entering open cut coal mines in the Latrobe Valley. This should occur as part of the regular review of the Latrobe Planning Scheme that is due to be completed in 2014.

The Board has not included a recommendation on this issue because is not directly within the Inquiry's Terms of Reference, the Board did not hear opinion evidence from appropriate experts, the evidence that touched on this issue was not examined in depth, and the Board has not been able to effectively consider all options relevant to this issue.

INTEGRATED FIRE MANAGEMENT PLANNING

The development of integrated fire management plans in the Latrobe Valley presents an opportunity to recognise that there are current sources of risk across the Latrobe Valley landscape, such as pre-existing plantations and roadside vegetation, and that these risks need to be managed with the most effective risk treatments available.

ESTABLISHING CLEAR RESPONSIBILITY FOR THE IMPLEMENTATION OF PLANS

Fire risk management planning is currently occurring at the state, regional and municipal levels, and there is consistency between plans in the recognition of priority risks and assets. The plans are being developed with the involvement of a broad range of stakeholders. However, there is a fundamental weakness with the plans—it is unclear who is responsible for their implementation. Accordingly, no one is ensuring or monitoring their implementation. Counsel Assisting the Inquiry described this dilemma as follows:

> There is a significant issue on the evidence concerning the effective implementation of these plans. In fact the evidence suggests that the plans are not implemented at all. Nor have they been reviewed by the affected agencies to check that the suggested treatments are possible or within the appropriate jurisdiction.[71]

The Board endorses this view. It is concerned that the plans that have emerged from the process of integrated fire management planning are of limited practical impact.

To ensure that integrated fire management plans are implemented, the Board considers that there must be clarity about who is responsible for their implementation. Mr Lapsley has suggested that the first step is to modernise the legislative basis for fire management planning. The Board endorses this view. The establishment of clear statutory responsibility for the implementation of integrated fire management plans would create an opportunity to clarify the responsibilities for implementation of these plans at the municipal, regional and state level.

The Board considers that a great deal has been achieved in integrated fire management planning but more needs to be done for the Victorian community to gain the full benefit that it offers. The review of emergency management planning raised during the Inquiry by Mr Lapsley is an opportunity to initiate a more collaborative approach to integrated fire management planning that directly involves those people responsible for fire risk management. The intention of this review is to achieve more holistic and coordinated accountability for specific hazards. This planning approach will more closely involve industry, including GDF Suez, during hazard planning.

The evidence has established that the Hazelwood mine and the mine's regulators are key players currently missing from the integrated fire management planning process. It is crucial that members of the community, government and industry who are responsible for fire risk management and who live with the risk of fire within the Latrobe Valley, play a role in the development and implementation of fire risk management plans. This may take the form of providing advice about the nature of a fire risk or the means to control the risk. Establishing a clear line of sight to the responsible regulators for integrated fire management planning should ensure that the actions in the plans are monitored and implemented.

There are a number of problems with the Gippsland Regional Strategic Fire Management Plan. In these circumstances, the Board considers that the regional plan should be reviewed.

RECOMMENDATION 3

The State enact legislation to:

- require Integrated Fire Management Planning; and
- authorise the Emergency Management Commissioner to develop and implement regional and municipal fire management plans.

1. Exhibit 62 – Latrobe Planning Scheme extracts, VPP clause 10 – Operation of the State Planning Policy Framework
2. Exhibit 62 – Latrobe Planning Scheme extracts, VPP clause 13 – Environmental Risks, clause 13.05 – Bushfire
3. Pullman T1717:26 – T1718:12
4. Department of Planning and Community Development 2014, *Latrobe Planning Scheme*, viewed 25 July 2014, http://planningschemes.dpcd.vic.gov.au/schemes/combined-ordinances/Latrobe_PS_Ordinance.pdf, VPP section 30
5. Department of Planning and Community Development 2014, *Latrobe Planning Scheme*, viewed 25 July 2014, http://planningschemes.dpcd.vic.gov.au/schemes/combined-ordinances/Latrobe_PS_Ordinance.pdf, VPP section 40
6. *Planning and Environment Act 1987* (Vic), s. 8A
7. *Planning and Environment Act 1987* (Vic), s. 8A(2)
8. Department of Planning and Community Development 2014, *Latrobe Planning Scheme*, viewed 25 July 2014, http://planningschemes.dpcd.vic.gov.au/schemes/combined-ordinances/Latrobe_PS_Ordinance.pdf
9. Exhibit 62 – Latrobe Planning Scheme extracts, LPP clause 21.03 – Natural Environment Sustainability
10. Exhibit 62 – Latrobe Planning Scheme extracts, LPP clause 21.07 – Economic Sustainability, clause 21.07-3 – Coal Resources Overview
11. Exhibit 62 – Latrobe Planning Scheme extracts, LPP clause 21.07 – Economic Sustainability, clause 21.07-4 – Coal Buffers Overview
12. Exhibit 62 – Latrobe Planning Scheme extracts, VPP clause 37.01 – Special Use Zone, Schedule 1
13. Pullman T1719:7-10
14. Exhibit 61 – Statement of Jason Pullman, paras 38-44; attachment JP-7
15. Exhibit 62 – Latrobe Planning Scheme extracts, LPP clause 42.01 – Environmental Significance Overlay; Schedule 1
16. Exhibit 62 – Latrobe Planning Scheme extracts, LPP clause 42.01 – Environmental Significance Overlay; Schedule 1
17. Exhibit 62 – Latrobe Planning Scheme extracts, VPP 44.06 – Bushfire Management Overlay
18. *Planning and Environment Act 1987* (Vic), s. 12B
19. Exhibit 92 – Expert report of Roderic Incoll, paras 235-257
20. Exhibit 62 – Latrobe Planning Scheme extracts, LPP clause 21.07 – Economic Sustainability, clause 21.07-3 – Coal Resources Overview
21. Exhibit 62 – Latrobe Planning Scheme extracts, VPP clause 37.01 – Special Use Zone, Schedule 1
22. Exhibit 61 – Statement of Jason Pullman, attachment JP2
23. Exhibit 61 – Statement of Jason Pullman, paras 9-12; Pullman T1716:2 – T1720:29
24. Statement of Cameron MacDonald (Hancock Victorian Plantations); Letter from Karl Kny, Chief Executive Officer, Hancock Victorian Plantations, 8 June 2014
25. Letter from David Mawer, Managing Director, Gippsland Water,18 June 2014
26. Exhibit 82 – Correspondence provided by GDF Suez in relation to neighbouring timber plantations
27. Exhibit 82 – Correspondence provided by GDF Suez in relation to neighbouring timber plantations
28. Exhibit 82 – Correspondence provided by GDF Suez in relation to neighbouring timber plantations
29. Exhibit 59 – Statement of Kylie White, para. 50; attachment KAW-12
30. Exhibit 59 – Statement of Kylie White, paras 96-98; attachments KAW-22 & KAW-23
31. Pullman T1722:17 – T1724:13
32. Incoll T2198:2 – T2201:10
33. Exhibit 92 – Expert report of Roderic Incoll, paras 255-257
34. Exhibit 92 – Expert report of Roderic Incoll, p. 36, figure 12
35. Letter from Karl Kny, Chief Executive Officer, Hancock Victorian Plantations, 18 June 2014
36. Exhibit 92 – Expert report of Roderic Incoll, para. 254
37. *Country Fire Authority Act 1958* (Vic)
38. Exhibit 72 – Statement of Lance King, paras 11 & 12
39. Exhibit 72 – Statement of Lance King, attachment LK-2
40. King T1912:23 – T1913:6
41. Exhibit 72 – Statement of Lance King, para. 29
42. Exhibit 1 – Statement of Craig Lapsley, para. 212
43. Exhibit 1 – Statement of Craig Lapsley, para. 227.7
44. Exhibit 72 – Statement of Lance King, para. 17
45. Exhibit 63 – Latrobe City Fire Management Plan, p. 50
46. King T1917:3-4
47. King T1917:5-8
48. Pullman T1728:14 – T1729:7
49. Exhibit 92 – Expert report of Roderic Incoll, paras 104 & 123
50. Exhibit 92 – Expert report of Roderic Incoll, para. 122
51. Exhibit 92 – Expert report of Roderic Incoll, para. 123
52. Exhibit 92 – Expert report of Roderic Incoll, para. 105
53. Exhibit 92 – Expert report of Roderic Incoll, para. 120
54. Exhibit 92 – Expert report of Roderic Incoll, para. 64
55. Incoll T2154:2-4
56. Lapsley T2313:19 – T3217:11; Exhibit 1 – Statement of Craig Lapsley, para. 217
57. Exhibit 1 – Statement of Craig Lapsley, paras 210 & 217; para. 210 attachment, Gippsland Regional Strategic Fire Management Plan 2013 – 2023 (FSC.0008.002.0001)

58. The Board notes that s. 9 was repealed by s. 78(3) of the *Emergency Management Act 2013* (Vic) with effect from 1 July 2014
59. Lapsley T2315:13-20
60. Exhibit 1 – Statement of Craig Lapsley, para. 210 attachment, Gippsland Regional Strategic Fire Management Plan 2013 – 2023 (FSC,0008.002.0001)
61. Exhibit 1 – Statement of Craig Lapsley, para. 210 attachment, Gippsland Regional Strategic Fire Management Plan 2013 – 2023 (FSC,0008.002.0001)
62. Exhibit 1 – Statement of Craig Lapsley, para. 210 attachment, Gippsland Regional Strategic Fire Management Plan 2013 – 2023 (FSC.0008.002.0001), p. 27
63. Neist T1848:1-11
64. Lapsley T2313:3-7
65. White T1594:11 – T1595:31; Neist T1848:19 – T1851:21
66. Pullman T1728:14 – T1729:7
67. Lapsley T2313:19 – T2323:14
68. Written submission of GDF Suez,18 June 2014, para. 212
69. Exhibit 92 – Expert report of Roderic Incoll, para. 254
70. Lapsley T2321:3-18
71. Written submission of Counsel Assisting, 17 June 2014, section 4.1, para. 65

3.2 REGULATION OF FIRE RISK AT THE HAZELWOOD MINE

OVERVIEW

As part of its Terms of Reference, the Board of Inquiry has been asked to inquire into and report on the adequacy and effectiveness of the application and administration of relevant regulatory regimes in relation to the risk of, and response to, fire at the Hazelwood mine.

This Chapter discusses the regulatory regime governing mining activities conducted by GDF Suez at the Hazelwood mine and explores the legal requirements applicable to GDF Suez in relation to the risk of fire. This Chapter also examines the responsibility of government agencies in relation to fire risk at the mine, and recommends improvements to the regulatory regime to ensure incidents like the Hazelwood mine fire are avoided in the future.

The principal regulatory mechanisms that govern the risk and prevention of fire at the Hazelwood mine are mine licensing laws, which are administered and enforced by the Earth Resources Regulation Branch of the Department of State Development, Business and Innovation (the Mining Regulator) and occupational health and safety laws, which are administered and enforced by the Earth Resources Unit of the Victorian WorkCover Authority.

The Board heard from senior representatives of the Mining Regulator and the Victorian WorkCover Authority. The Board also received numerous submissions from residents in the Latrobe Valley and community organisations who were concerned about a lack of supervision of environmental and public safety issues, such as fire risk and rehabilitation at the Hazelwood mine.

From 1 January 2008, responsibility for oversight of occupational health and safety matters in Victorian mines was transferred from the Mining Regulator to the Victorian WorkCover Authority. From this date, the Mining Regulator no longer considered itself to have any role in regulating fire risk at the Hazelwood mine. Meanwhile, the Victorian WorkCover Authority has concentrated its resources on monitoring workplace risks that have the greatest potential to cause worker fatalities.

The Board considers that each of the relevant agencies adopted a narrow reading of the statutory regime underlying their respective areas of responsibility. Contrary to arrangements between the Mining Regulator and the Victorian WorkCover Authority, which contemplated collaboration and consultation on areas such as public safety risks, the agencies operated in silos. Both agencies also demonstrated a passive approach to supervision of the Hazelwood mine by shifting complete responsibility for dealing with fire risk to GDF Suez. The Board is concerned that the manner in which the transition for occupational health and safety responsibility to the Victorian WorkCover Authority was effected meant that expertise and knowledge relevant to assessing fire risk at the Hazelwood mine was potentially lost.

The combination of these factors resulted in a gap in regulation of the Hazelwood mine in respect of fire risks with the potential to impact on Morwell and surrounding communities, such as that which manifested in 2014. The Hazelwood mine fire was a foreseeable risk that slipped through the cracks between oversight agencies, and as a consequence this reality must be confronted if similar incidents are to be avoided in the future.

The Board considers that the Mining Regulator and the Victorian WorkCover Authority both have a role in regulating fire risk in the Victorian mining sector. In order to effectively fulfil their shared responsibilities, the Mining Regulator and the Victorian WorkCover Authority need to be adequately equipped with staff that have the necessary fire expertise to monitor and enforce compliance with measures to mitigate fire risk.

The Board affirms the Mining Regulator's willingness to take on a role in addressing fire risk at Victorian coal mines, and recognises that the commencement of s. 16 of the *Mineral Resources (Sustainable Development) Amendment Act 2014* (Vic) and possibly further regulatory reform would assist this process. The Board recommends that the commencement date of s. 16 be brought forward to facilitate the requirement that approved work plans specifically address fire prevention, mitigation and suppression.

REGULATORY REGIME

The statutory regime governing coal mining activities in Victoria is complex and has evolved considerably over time.

Mine licensing and occupational health and safety laws are the principal regulatory mechanisms that govern GDF Suez's responsibilities concerning the risk and prevention of fire at the Hazelwood mine.

MINE LICENSING LEGISLATION

Coal mining activities in Victoria are regulated under the *Mineral Resources (Sustainable Development) Act 1990* (Vic) (Mineral Resources Act), the Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic) (Mineral Industries Regulations), and the Mineral Resources (Sustainable Development) (Extractive Industries) Regulations 2010 (Vic).

The stated purpose of the Mineral Resources Act is 'to encourage mineral exploration and economically viable mining and extractive industries which make the best use of, and extract the value from, resources in a way that is compatible with the economic, social and environmental objectives of the State.'[1]

To accomplish this purpose, one of the objectives of the Mineral Resources Act is to 'establish a legal framework aimed at ensuring that…the health and safety of the public is protected in relation to work being done under a licence…'.[2] The interests of the public are therefore at the heart of the mine licensing regime.

The primary instruments by which the purpose and related objectives of the Mineral Resources Act are fulfilled are mining licences, work plans and work authorities.[3] Because the licence for the Hazelwood mine was a product of its privatisation, the licensing process differed from requirements now in effect in Victoria.[4] The Hazelwood mine is subject to licensing and work plan provisions, but not to provisions relating to work authorities.[5]

The Minister for Energy and Resources is responsible for administration of the Mineral Resources Act and related regulations.[6] Administration of the Mineral Resources Act is overseen by the Earth Resources Regulation Branch of the Department of State Development, Business and Innovation (DSDBI), as the Minister's delegate.[7] In this Chapter, the Earth Resources Regulation Branch of DSDBI and its various predecessors will be referred to as 'the Mining Regulator', whilst noting that since 1 January 2008, the Victorian WorkCover Authority (VWA) has been the regulator for occupational health and safety in mines.

Under s. 8(1)(a) of the Mineral Resources Act, a person cannot carry out mining in Victoria without obtaining a mining licence from the Minister. An applicant for a mining licence must satisfy the Minister that it can meet the requirements set out in s. 15(6) of the Mineral Resources Act. The Minister is empowered to impose conditions on a mining licence.[8]

On its own, a mining licence is insufficient authority to carry out mining activities.[9] Section 40 of the Mineral Resources Act requires that an approved work plan must be lodged with the Department Head of the Mining Regulator before the licensee can undertake mining work. Under s. 39, the operator of a mine must comply with any conditions on the mining licence and the approved work plan, and work in accordance with the approved work plan.

The Department Head of the Mining Regulator approves a work plan. The Department Head may specify, in granting such an approval, that certain conditions must be observed by the licensee in carrying out the work plan.[10] Under s. 41, the Department Head may vary a work plan at his or her discretion.

The conditions that a Minister or the Department Head may impose in respect of a mining licence, work plan or work plan variation, are non-exhaustive—they include but are not limited to:

- rehabilitation of the land
- protection of the environment
- providing and implementing environmental offsets on the land or any other land
- work undertaken under a licence
- protection of community facilities.[11]

Section 40(3)(a) of the Mineral Resources Act requires that a work plan must contain 'prescribed information', which for a coal mine larger than five hectares means that the work plan must address the matters prescribed by Schedule 15 of the Mineral Industries Regulations.[12] Currently, Schedule 15 specifies that work plans must address matters such as:

- the anticipated extent of open cut extraction, with proposed bench height, berm details and working batters
- the sequencing of open cut extraction
- the location of topsoil dumps, and waste dumps or stockpiles
- proposals for landscaping of the site, including buffer zones
- access roads
- a rehabilitation plan, including concepts for the end utilisation of the site, and proposals for the progressive rehabilitation and end rehabilitation of the site
- an environmental management plan
- a community engagement plan
- for 'declared mines' such as the Hazelwood mine, mine stability.[13]

The rehabilitation plan for the Hazelwood mine was the subject of considerable attention during the Inquiry, as rehabilitation of worked out areas of a coal mine is a recognised means of eliminating or reducing the risk of fire. Once a worked out batter has been rehabilitated, coal is no longer exposed and it therefore follows that the rehabilitated land bears no greater fire risk than any other ordinary part of the rural landscape.[14]

Progressive rehabilitation is of particular importance in the context of fire prevention in the short to medium term, as final, end rehabilitation at the Hazelwood mine is not expected to be completed until at least 2031.[15]

Rehabilitation at the Hazelwood mine is explored in further detail in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

Professor Samantha Hepburn of the School of Law at Deakin University made a submission to the Board, which explored the concept of the rehabilitation plan in more detail. She explained that:

> The underlying rationale for a rehabilitation plan is to provide an outline of how a mining licencee [sic] plans to remediate and mitigate the impact of the mining process upon the land and the landscape during the operational life of the mine. The guidelines that accompany the [Mineral Resources Act] provide further detail regarding how a rehabilitation plan should be constructed. The guidelines make it clear from the outset that the rehabilitation plan must direct, from the date when the licence is applied for, remediation and maintenance of the land and the mining operations will occur during the currency of the licence.[16]

Under the Mineral Resources Act, a mine licensee is also required to:

- rehabilitate land in accordance with the approved rehabilitation plan (which forms part of the work plan)[17]
- enter into a rehabilitation bond for an amount determined by the Minister, which the Minister may subsequently reassess and increase[18]
- consult with the community by sharing information and providing members of the community with an opportunity to express their views about mining activities that may affect the community[19]
- notify the Chief Inspector of Mines of 'reportable events', which include a 'major outbreak of fire'.[20]

Section 110 of the Mineral Resources Act empowers the Minister to issue a notice requiring the mine licensee to take a specific action or stop work if the Minister believes on reasonable grounds that (among other things) any action or omission of a licensee is likely to result in a risk to public safety, the environment, land, property or infrastructure, or breaches a condition applying to the licence or work plan.

In practice, the Mining Regulator considers this 'stop work' power a drastic measure that would only be relied upon 'in extreme situations or when previous notices had not been dealt with.'[21]

UPCOMING REFORM

A number of amendments to the Mineral Resources Act will come into effect over the next two years.

The *Mineral Resources (Sustainable Development) Amendment Act 2014* (Vic) (Mineral Resources Amendment Act) received royal assent on 25 February 2014. Under s. 16 of the Mineral Resources Amendment Act, the existing s. 40(3) of the Mineral Resources Act will be amended so that work plans will need to meet the following requirements:

> (3) A work plan must –
>
> (a) be appropriate in relation to the nature and scale of the work proposed to be carried out; and
>
> (b) identify the risks that the work may pose to the environment, to any member of the public, or to land or property in the vicinity of the work; and
>
> (c) specify what the licensee will do to eliminate or minimise those risks as far as reasonably practicable; and
>
> (d) if the licence is a mining licence or prospecting licence, in relation to the mining activities proposed to be carried out under the licence, include a plan for consulting with the community that demonstrates that the licence holder will use appropriate and effective measures to consult with the community throughout the period of the licence and is prepared in accordance with the regulations and any guidelines issued by the Minister relating to such plans (a community engagement plan); and
>
> (e) if the licence is a mining licence or a prospecting licence under which mining activities are proposed to be carried out, include a rehabilitation plan for the land proposed to be covered by the licence; and
>
> (f) if the licence is a mining licence relating to a declared mine, contain the prescribed mine stability requirements and processes; and
>
> (g) contain any other matters required by the regulations.

The Board heard evidence that the requirements emphasised above might assist the Mining Regulator to require work plans to address fire risk in Victorian mines. This is explored in further detail below under the heading 'Oversight by the Mining Regulator'.

The amendment is designed to achieve a more outcome-based approach to regulation of work plans. It reflects mining regulation reform recommended by the Economic Development and Infrastructure Committee:

> That the Victorian Government considers redirecting the regulatory focus of exploration, mining and extractive work plans towards outcomes and away from prescriptive conditions, in order to better manage risk and achieve socially, economically and environmentally sound outcomes.[22]

Section 16 does not come into operation until 31 December 2016, unless proclaimed earlier.[23]

OCCUPATIONAL HEALTH AND SAFETY LEGISLATION

All Victorian workplaces, including the Hazelwood mine, are subject to obligations under the *Occupational Health and Safety Act 2004* (Vic) (OHS Act) and the Occupational Health and Safety Regulations 2007 (Vic) (OHS Regulations).

Administration and enforcement of the OHS Act and OHS Regulations is the responsibility of the VWA.

OCCUPATIONAL HEALTH AND SAFETY ACT

The principal objects of the OHS Act are to secure the health, safety and welfare of employees and other persons at work and to eliminate (at the source) risks to health, safety or welfare.[24] The Act also aims 'to ensure that the health and safety of members of the public is not placed at risk by the conduct of undertakings by employers and self-employed persons.'[25]

The following critical principles underpin the operation and interpretation of the OHS Act:

- The importance of health and safety requires that employees, other persons at work and members of the public be given the highest level of protection against risks to their health and safety that is reasonably practicable in the circumstances.
- Persons who control or manage matters that give rise or may give rise to risks to health or safety are responsible for eliminating or reducing those risks so far as is reasonably practicable.
- Employers and self-employed persons should be proactive, and take all reasonably practicable measures, to ensure health and safety at workplaces and in the conduct of undertakings.[26]

The OHS Act adopts a self-regulatory and performance-based model rather than a traditional prescriptive approach to workplace safety regulation. Mr Leonard Neist, Executive Director of the Health and Safety Unit at the VWA, explained the difference as follows:

> Generally, Victorian OHS laws are based on the 'Robens model' of regulation. The recommendations made by Robens' Committee in 1972 (in the UK) resulted in widespread legislative reform in health and safety regulation. In essence OHS laws shifted from detailed, prescriptive standards to a more self-regulatory and performance-based approach. Instead of prescribing how to do (or not do) something, the OHS Act requires the owner of the risk (the duty holder) to take responsibility to achieve the desired outcome. In other words, the Act identifies the outcome (a safe workplace) but places the responsibility on the duty holder to identify the risks and the controls needed to achieve the outcome.
>
> At present in Victoria, a combination of prescriptive and performance based regulatory elements exist in our legal framework, as the Regulations do contain some prescriptive requirements.[27]

The principal statutory obligations relevant to this Inquiry are ss. 21 and 23 of the OHS Act.

Section 21 of the OHS Act obliges all employers to provide and maintain, so far as is reasonably practicable, a working environment that is safe and without risks to health. Section 21 applies to employees, defined to include independent contractors engaged by the employer, as well as employees of any such independent contractors.[28]

The duty under s. 23 of the OHS Act is broader than s. 21. It compels employers to ensure that, so far as is reasonably practicable, persons other than employees are not exposed to risks to their health or safety arising from the conduct of the undertaking of the employer.

The duty imposed by s. 23 requires an employer to eliminate risks to health and safety so far as is reasonably practicable, or if it is not reasonably practicable to eliminate risks to health and safety, to reduce those risks so far as is reasonably practicable.[29]

In the context of the Hazelwood mine fire, s. 23 would extend to firefighters (career and volunteer) and members of Morwell and surrounding communities. The duty applies only to the extent that risks to health or safety arise 'from the conduct of the undertaking of the employer' and only to the extent that the mine's operator did not eliminate or reduce risks 'so far as is reasonably practicable'.

The meaning of 'so far as is reasonably practicable' and risks arising 'from the conduct of the undertaking of the employer' were discussed at length during the Inquiry.

As noted by Mr Neist, the term 'so far as is reasonably practicable' is not defined by the OHS Act.[30] Section 20(2) of the OHS Act specifies a number of matters to which an employer must have regard to determine what is (or was at a particular time) reasonably practicable. These are:

- the likelihood of the hazard or risk concerned eventuating
- the degree of harm that would result if the hazard or risk eventuated
- what the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk
- the availability and suitability of ways to eliminate or reduce the hazard or risk
- the cost of eliminating or reducing the hazard or risk.

A number of further considerations apply when interpreting what is 'reasonably practicable' for the purposes of the OHS Act. According to a VWA guideline publication issued under s. 12 of the OHS Act:

- The test is an objective one and reflects the interpretative principle in s. 4 of the OHS Act:

  The test for what is reasonably practicable is an objective test; that is, a person is to be judged by the standard of behaviour expected of a reasonable person in the duty holder's position who is required to comply with the same duty, and is committed to providing the highest level of protection for people against risks to their health and safety and is proactive in taking measures to protect the health and safety of people.

- In applying the concept of what is reasonably practicable, careful consideration must be given to each of the matters set out in s. 20(2) of the OHS Act and no one matter determines what is or was reasonably practicable in relation to ensuring health and safety.

- In terms of assessing the cost of eliminating or reducing the hazard or risk:

  There must be a clear presumption in favour of safety. Once the likelihood and degree of harm from hazard or risk is understood and the availability and suitability of a relevant safety measure to eliminate or reduce the hazard of risk is established, that safety measure should be implemented unless the cost of doing so is so disproportionate to the benefit in terms of reducing the severity of the hazard that it would clearly be unreasonable to justify the expenditure.

- In some circumstances, cost could never be used as a justification for failing to implement an appropriate control measure:

  If the degree of harm is significant, then it is extremely unlikely that the cost of eliminating or reducing the risk would ever be so disproportionate to the risk to justify a decision not to implement an available and suitable control measure. Moreover, the question of what is reasonably practicable is to be determined objectively and not by reference to the duty holder's capacity to pay or other particular circumstances.[31]

Mr Neist confirmed that the above criteria reflect current VWA policy.[32]

Mr Neist further explained to the Board that evaluating the cost of eliminating or reducing the hazard or risk involves consideration not only of the cost of implementing a particular control to eliminate or reduce the risk, but also the cost of not implementing a control[33]—that is, 'it is a full economic analysis, it's not just a dollar cost analysis.'[34]

OCCUPATIONAL HEALTH AND SAFETY REGULATIONS

Part 5.3 of the OHS Regulations creates a range of specific additional obligations with respect to mines. In particular, rr. 5.3.7 to 5.3.9 are intended to reflect the way in which the statutory duties under ss. 21 and 23 of the OHS Act are to be performed by mine operators.[35]

Under r. 5.3.7(1) of the OHS Regulations, the operator of a mine must, so far as is reasonably practicable, identify all mining hazards at the mine and assess the risks to health or safety associated with all mining hazards at the mine. Mining hazards are defined to include 'mine fires or explosions'.[36]

In assessing the risks to health or safety associated with a mining hazard under r. 5.3.7(1), the operator must have regard to:

- the nature of the mining hazard
- the likelihood of the mining hazard causing, or contributing to, any harm to any person
- the severity of the harm that may be caused.[37]

Under r. 5.3.8(1) of the OHS Regulations, the operator of a mine must also adopt risk control measures that:

- eliminate so far as is reasonably practicable risks to health or safety associated with any mining hazards at the mine, or
- if it is not reasonably practicable to eliminate those risks, reduce those risks so far as is reasonably practicable.

Once risk control measures have been adopted, r. 5.3.9 requires the operator of a mine to review and, if necessary, revise (at least every three years, and after any incident involving a mining hazard):

- the identification of mining hazards
- the assessment of risks to health or safety associated with mining hazards
- the risk control measures adopted.

'Prescribed mines', including the Hazelwood mine, are subject to a range of additional obligations.[38] In particular, r. 5.3.21 requires the operator of a prescribed mine to establish and implement a Safety Management System. A Safety Management System is a document that must (among other things) 'provide a comprehensive and integrated management system for all risk control measures adopted under r. 5.3.8.'[39] A Safety Management System must be reviewed and, if necessary, revised at least every three years, as well as if an incident involving a mining hazard occurs at the mine.[40]

A further regulation (r. 5.3.23) applies in respect of 'major mining hazards', that is, 'a mining hazard that has the potential to cause an incident that would cause, or pose a significant risk of causing, more than one death.'[41] In order to assess the risks associated with major mining hazards, an operator of a prescribed mine must conduct a comprehensive and systematic Safety Assessment. The Safety Assessment must include an investigation and analysis of the major mining hazards in order to provide the operator with a detailed understanding of all aspects of risks to health or safety associated with major mining hazards.[42]

The Safety Assessment must also record (among other things):

- the methods used in the investigation and analysis
- the nature of each major mining hazard
- the likelihood of the major mining hazard causing, or contributing to causing, any harm to any person
- the severity of the harm that may be caused
- reasons for the decisions reached about the likelihood and severity of harm
- all measures considered for the control of risks associated with major mining hazards
- the reasons for adopting, or rejecting all risk control measures considered.[43]

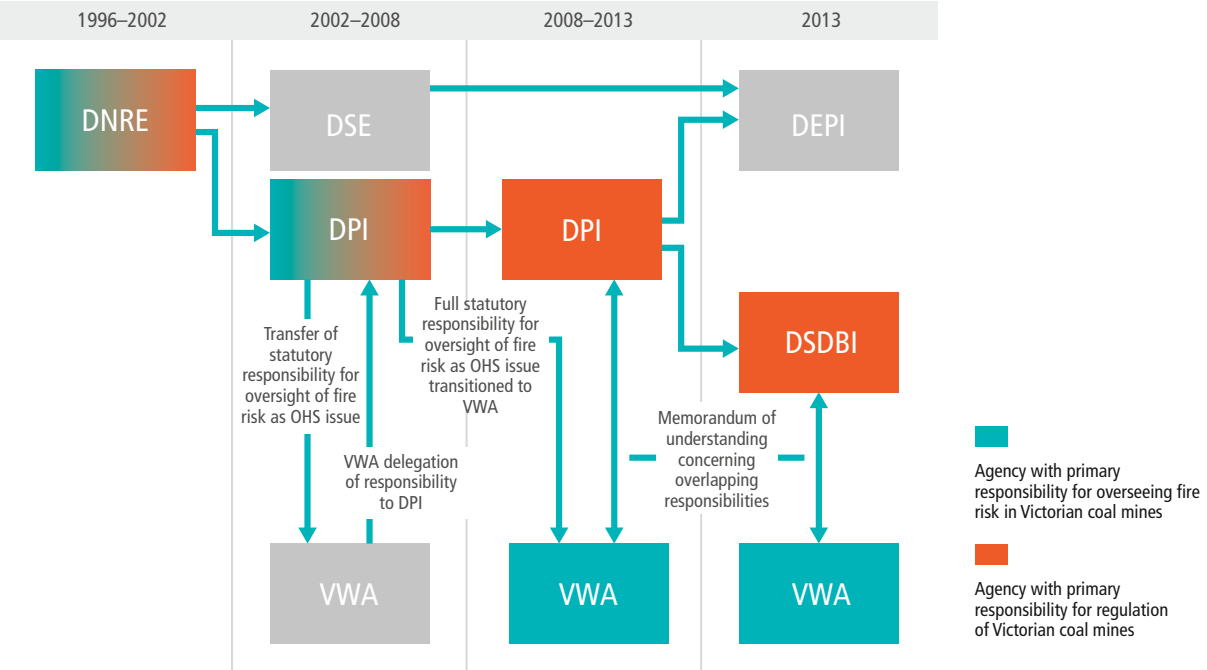
As the operator of a prescribed mine, GDF Suez was at all relevant times required to establish and implement a Safety Management System and to conduct a comprehensive and systematic Safety Assessment in relation to all 'major mining hazards'.

RECENT HISTORY OF REGULATION OF VICTORIAN COAL MINES

Ms Kylie White, Executive Director, Earth Resources Regulation Branch, DSDBI, provided evidence to the Board regarding recent and complex shifts in responsibility for regulatory oversight of Victorian coal mines. These shifts have led to a degree of uncertainty regarding the extent to which different government agencies have responsibility for regulating issues relating to fire risk, and concerns that there is a regulatory gap.

A representation of the evolution of mine regulation is shown in Figure 3.3 below.

Figure 3.3 Overview of regulatory oversight of fire risk at Hazelwood mine over time



From privatisation of the Latrobe Valley mines in 1996 until 4 December 2002, the Department of Natural Resources and Environment (DNRE) was responsible for regulation of the Hazelwood mine.

On 5 December 2002, the DNRE split into the Department of Primary Industries (DPI) and the Department of Sustainability and Environment (DSE). Following this split, responsibility for oversight of coal mines resided with DPI.

On 1 July 2013, DPI and DSE re-merged to form the Department of Environment and Primary Industries (DEPI). However, responsibility for regulation of coal mines was transferred to the Earth Resources Regulation Branch of DSDBI, the present Mining Regulator.[44]

In 2002, a range of legislative reforms meant responsibility for ensuring compliance with occupational health and safety (OHS) requirements shifted from the jurisdiction of the Mining Regulator (then DPI) to VWA.[45] However, work plans for mines were required to include an OHS plan.[46] This meant that the Mining Regulator was able to influence the OHS practices of mine operators through the work plan approval process. VWA delegated its power to enforce the OHS regime to the Mining Regulator, with the effect that the Mining Regulator remained in charge of regulating OHS at the mine, just as it had prior to 2002. VWA and the Mining Regulator also entered into a Memorandum of Understanding, which detailed the manner in which the agencies would collaborate, share resources and information, and carry out investigations.[47]

In May 2006, Mr Neil Pope reported to the Minister for Energy, Industries and Resources about the regulation of OHS in Victoria's earth resources industries. He recommended that the VWA take direct responsibility for the administration and enforcement of the OHS regime and the Mining Regulator retain responsibility for the approval of work plans under the Mineral Resources Act.

One of the recommendations of the 2006 Pope Report was that the newly established unit within the VWA 'should include the transfer from the DPI of at least two qualified mining engineers and all regulation officers currently within the Minerals and Extractive Operations Branch.'[48]

According to Ms White, only one staff member from the Mining Regulator transferred to VWA.[49]

The recommendations in the 2006 Pope Report were adopted and from 2006 to 2008, transitional arrangements were put in place to manage the transfer of OHS responsibilities from the Mining Regulator to VWA.[50]

On 20 December 2007, the delegation of OHS powers to the Mining Regulator was withdrawn by VWA.[51] According to Ms White, 1 January 2008 marked the transition of OHS responsibility to the VWA with the effect that from that date, the Mining Regulator ceased to have a role or responsibility in mitigating the risk of fire at the mine under the Mineral Resources Act.[52]

A series of legislative changes in 2010 completed the transfer of responsibility for OHS matters in mines to the VWA.

Prior to 2010, work plans were required to include '[a]n occupational health and safety plan that demonstrates, so far as is practicable, that the works are designed and will be operated so as to be safe and without risks to health.'[53] It was through this requirement that the Mining Regulator was able to ensure that mining licensees adopted policies and strategies directed to the prevention and mitigation of the risk of fire in the mine.

With the commencement of the Mineral Resources Development (Mining) Amendment Regulations 2010 (Vic), the requirement to include an OHS plan in a work plan was removed.[54] The provision in the Mineral Resources Act that empowered the Governor in Council to make regulations concerning health and safety plans was also repealed in the same year.[55]

Finally, a new requirement for mine operators to notify the Mining Regulator of major outbreaks of fire was inserted into the Mineral Resources Act.[56]

The transition of OHS responsibilities from the Mining Regulator to VWA was the subject of an audit conducted by Deloitte Touche Tohmatsu (Deloitte) in June 2008. The audit concluded that:

- There was clear awareness of responsibilities for OHS in the mining industry that were transferred from the Mining Regulator to VWA.
- The residual risk to the Mining Regulator (including the residual risk associated with public safety) following the transfer of responsibilities for OHS in the mining industry to VWA was appropriately understood and resourced.
- The Mining Regulator could demonstrate that it had made all practicable attempts to ensure a comprehensive transition of OHS responsibility to VWA.[57]

The audit also noted that:

> Copies of recent OH&S information pertaining to sites have been provided to [VWA] electronically. There is some information located on hard copy files that will remain with DPI. In the future, [VWA] may wish to view this historical information. The agencies will share access to current information as arranged and agreed through local managers.[58]

However, Mr Kevin Hayes, Field Subject Matter Expert and Workplace Inspector in the Earth Resources Unit of the VWA, told the Board that VWA did not have access to files of the Mining Regulator in relation to the Hazelwood mine before 1 January 2008, as suggested by the Deloitte audit.[59]

Following the Inquiry's public hearings, the Victorian Government provided further clarification around these issues:

- In relation to the transfer of staff, it was suggested that rather than force Mining Regulator staff to VWA, VWA conduct an open recruiting process to employ three mining engineers and two inspectors for mines. Additional responsibilities would be absorbed within existing staffing at VWA.
- In relation to the availability of files, 600–700 files were assessed for transfer from the Mining Regulator to VWA. In relation to the Hazelwood mine, the Mining Regulator retained the hard copy of registered site files and audit program files (including results). VWA was to be given copies if it requested them.[60]

In its submission to the Board, the Victorian Government also noted that the Deloitte audit referenced a number of mechanisms through which mining industry knowledge was transferred from DPI to VWA from 2006 to 2008. This included monthly steering committee meetings attended by senior officers from the Mining Regulator and VWA,[61] and other activities such as a tripartite forum, the production of a minerals and extractive operations newsletter, training and presentations.[62]

It is apparent from the audit report that Deloitte was engaged by the Mining Regulator and in conducting its audit, Deloitte only held discussions with staff employed by the Mining Regulator and not VWA.[63]

CURRENT RESPONSIBILITIES FOR REGULATION

The relationship between the Mining Regulator and VWA is now governed by a further Memorandum of Understanding, effective from 1 January 2011 to 31 December 2013. By convention, this Memorandum of Understanding is treated as ongoing until a new agreement is entered into.[64]

Clause 1.2 of Schedule 1 of the current Memorandum of Understanding governs the manner in which the parties propose to manage areas of overlapping responsibilities with respect to work in Victorian mines:[65]

> 1.2 Overlapping responsibilities
>
> 1.2.1. Both agencies have objectives in their legislation that dictate responsibility for public safety matters and the use of explosives. WorkSafe Victoria has responsibility for public safety arising from work-related activities.
>
> 1.2.2. WorkSafe Victoria and DPI will consult on matters where their jurisdictions overlap with the lead agency being the agency with the highest degree of control over the issue. (Note safety aspects of gathering lines under the Petroleum Act 1998 will also be referred to EnergySafe Victoria ("ESV").)

Safety Related Elements	DPI	WorkSafe Victoria
Public safety and amenity	✔Lead Agency	✔Support Agency
Public safety (work related)	✔Support Agency	✔Lead Agency
Operation design and works approval	✔Lead Agency	✔Support Agency
Variations to operation plans and licences	✔Lead Agency	✔Support Agency
Well Integrity	✔Lead Agency	✔Support Agency
Occupational health and safety	✔Support Agency	✔Lead Agency
Explosives	✔Support Agency	✔Lead Agency
Blasting impacts (airblast & ground vibration)	✔Lead Agency	✔Support Agency
Site rehabilitation planning	✔Lead Agency	N/A
Site rehabilitation activity	✔Lead Agency	✔Support Agency

Under the Memorandum of Understanding, the Mining Regulator is the lead agency for 'public safety and amenity'.

When asked to clarify what 'public safety and amenity' refers to in the context of the Mining Regulator's responsibilities, Ms White responded that it:

> relates to or has been described as matters relating to safe access, gates, fencing, ensuring that the site is secure and that, if you like, the public are not put unnecessarily at risk from being able to enter the site or be impacted by what's happening. There is another aspect which relates to mine stability or the need to be able to ensure that, for example, the northern batters, which are terminal batters, that means they're not going to be worked any further, that those batters are seen to be stable and don't pose a risk to the public.[66]

Ms White agreed that this was not spelled out in the table referred to above.[67]

Mr Neist told the Board that 'public safety (work related)' was synonymous with the extent of the responsibility for public safety under s. 23 of the OHS Act, that is, risks to the health and safety of persons other than employees that arise from the conduct of the undertaking of the employer.[68]

Mr Neist also provided an opinion to the Board relevant to the interpretation of risks arising 'from the conduct of the undertaking of the employer.' Mr Neist submitted to the Board that the Hazelwood mine fire did not arise from the conduct of the mine operator's undertaking, because 'the undertaking is to extract brown coal from the earth and transport the brown coal to a power station; there is nothing in that conduct that caused the fire.'[69] On this view, the Hazelwood mine fire was beyond VWA's regulatory reach under s. 23.

The Victorian Government submitted that Mr Neist's evidence on this issue was given without the 'benefit of legal advice' and 'should not be taken as reflecting VWA's considered position.'[70]

Counsel Assisting the Inquiry submitted that Mr Neist's view was incorrect both as a matter of law and fact, namely:

- Courts have construed s. 23 (and its equivalent provisions in other similar statutes) broadly and in a manner that is consistent with the objects of the OHS Act. Generally speaking, where an activity or event occurs at the place at which the undertaking is carried out, it will be considered to arise from the conduct of the undertaking.[71]
- The worked out areas of the Hazelwood mine are not 'non-operational'—there is extensive infrastructure (such as high voltage power lines, pipes, watering systems, geotechnical monitoring equipment) in and around the northern batters which are essential to the mine's operations.

The Victorian Government tentatively supported the position of Counsel Assisting.[72]

Mr Neist agreed that this suggested a regulatory gap exists in relation to a fire risk that does not arise from the conduct of the undertaking of the employer:

> If I identify that gap as, who is responsible for regulating for the protection of public safety, regardless of what the source of the hazard or the risk is, who's responsible for public safety, that's where the gap probably is and I can't—if you were to ask me right now, I can't tell you who is responsible for regulating public safety. I'm responsible for regulating workplace safety and responsible for public safety as a result of the conduct of that undertaking, but I couldn't tell you who is directly responsible.[73]

REGULATORY OVERSIGHT OF THE HAZELWOOD MINE

OVERSIGHT BY THE MINING REGULATOR

More than one half of the Mining Regulator's staff is devoted to regulating the mining industry. Each year the Mining Regulator has approximately 1,700 contacts with licensees and applicants concerning licences and approvals under the Mineral Resources Act.[74]

The Mining Regulator has an inspectorate headed by the Chief Inspector of Mines, Mr John Mitas.[75] There is a local mining inspector located in the Latrobe Valley, Ms Anne Bignall, who reports to the Chief Inspector of Mines. The local mining inspector visits the Hazelwood mine on average once a month and undertakes a range of activities, including monitoring progress of the work plan and verifying whether work has been performed in accordance with the work plan.[76]

Prior to 1 January 2008, when the Mining Regulator considered that fire risk fell within its area of responsibility, the agency maintained close supervision of fire prevention and mitigation practices at the Hazelwood mine.

Records held by the Mining Regulator indicate that from 2001 through to 2008, five significant fire events were notified to the Mining Regulator.[77] Prior fires at the Hazelwood mine are discussed in further detail in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

The Mining Regulator took a range of actions in response to these incidents, including:

- conducting inspections
- assisting with CFA investigations into an incident
- issuing directions for the licensee to conduct risk assessments, review policies and procedures and formulate action plans.[78]

In relation to a fire that occurred on 15 November 2003, the Mining Regulator was prepared to direct the licensee to undertake very specific measures in response to the incident and to provide an action plan within 14 days.[79]

The Mining Regulator closely scrutinised GDF Suez's response to another fire that occurred in October 2006. On that occasion, the Mining Regulator assisted the County Fire Authority (CFA) in conducting an investigation into the cause of the incident. The Mining Regulator also issued an improvement notice to GDF Suez to comply with recommendations from an independent consultant's report into the incident, which involved a wholesale review of the mine's Mine Fire Service Policy and Code of Practice and emergency management plan.[80] The Mining Regulator also obtained copies of the updated Mine Fire Service Policy and Code of Practice and other fire management policies before deeming that GDF Suez had complied with the improvement notice.[81]

Ms White made clear the Mining Regulator's position as a consequence of changes on 1 January 2008: 'we don't regulate fire.'[82]

In relation to the Mining Regulator's current role with respect to the prevention and mitigation of fire at the Hazelwood mine, Ms White explained that:

- The Mining Regulator presently does not participate in the Integrated Fire Management Planning at state level, at regional level in the Gippsland region, or at municipal level in the City of Latrobe.
- The Mining Regulator presently has a support role in responding to a fire emergency at Hazelwood mine under the Emergency Management Manual Victoria.[83]
- A mine licensee must notify the Chief Inspector of Mines in the event of a fire.[84]

Ms White noted public concern about whether rehabilitation of exposed batters could have prevented the ignition or the spread of fire in the mine and acknowledged that the concern was legitimate and warranted further consideration.[85] Ms White also welcomed the potential enhancement of the Mining Regulator's powers to include rehabilitation specifically for the purposes of fire risk[86] and the possibility of collaborating with other agencies, such as VWA, to strengthen the regulation of mines.[87]

Ms White identified two shortcomings in the mine licensing framework which she submitted prevented the Mining Regulator from fulfilling the public safety objectives of the Mineral Resources Act in relation to the likelihood of a fire igniting in the Hazelwood mine:

- The prescriptive approach currently taken in the Mineral Resources Act and the Mineral Industries Regulations is not apt at identifying and therefore addressing all risks that might arise from mining.
- It is doubtful that the Department Head of the Mining Regulator has the power to regulate fire risk mitigation at the Hazelwood mine.[88]

Work plan approvals are one of the only mechanisms available to the Mining Regulator to influence the conduct of a mine licensee. Ms White submitted to the Board that Schedule 15 to the Mineral Industries Regulations, which lists the prescribed information a work plan must contain, exemplifies the limits of the Mining Regulator's oversight. In Ms White's opinion, the list in Schedule 15 'limits rather than clarifies, setting boundaries for the matters to be provided for in a work plan and a rehabilitation plan that may not always be appropriate for every mine given the purpose and objectives of the [Mineral Resources Act].'[89]

In its written submission to the Board, the Victorian Government stated that the 'purposes of rehabilitation set out in ss. 78, 79 and 81(1) of the Mineral Resources Act do not include the mitigation of the risk of fire.'[90]

In contrast, Environment Victoria stated in its written submission to the Board that the Mining Regulator's analysis of Schedule 15 of the Mineral Industries Regulations was overly strict and unjustifiably limited. In Environment Victoria's submission, the requirements of Schedule 15 would permit a rehabilitation plan that had as one of its objects the mitigation of fire risk.[91]

While Ms White did not consider that the Mining Regulator is currently able to require work plans to address fire risk, this may change when s. 16 of the Mineral Resources Amendment Act and the new outcome-based s. 40(3) comes into operation.[92] Ms White noted that this change will 'flag a very strong intention to change the approach to work plans and, given that this is already in the public domain, I would consider that a mine operator would consider this in light of what they are doing today.'[93]

Ms White further suggested that while the terms of the new s. 40(3) of the Mineral Resources Act 'would assist the Department Head to require a work plan to address fire risk, in my view further reform would be required in order to ensure that a work plan and/or rehabilitation plan could, if appropriate, address bushfire risk.'[94]

Other submissions received by the Board debated whether it was appropriate for the Mining Regulator to have any role in overseeing public safety and environmental issues such as fire risk and rehabilitation.

For example, Mr David Langmore of Morwell, retired town planner and planning author, suggested rehabilitation of brown coal open cut mines is such a substantial, specialised and important task that a purpose-specific organisation should be established in the Latrobe Valley to oversee rehabilitation of the Latrobe Valley open cut mines.[95]

Environmental Justice Australia submitted to the Board that the Hazelwood mine fire was not the first serious mining incident in the Latrobe Valley to impact upon the environment and the community. In 2007, the mine batters at the Yallourn mine collapsed. In 2011, a section of the Princes Freeway at Morwell collapsed as a result of instability at the Hazelwood mine. In 2012 and 2013 the wall between the Morwell River and the Yallourn mine collapsed and the river flooded into the mine.

Environmental Justice Australia submitted that the fact there has been a series of incidents may be indicative of a more systemic failure of regulation of coal mining in the Latrobe Valley and warrants a more general investigation into the effectiveness of coal mining regulation and the role of the Mining Regulator. In particular, Environmental Justice Australia was concerned that the Mining Regulator's dual role to promote investment opportunities in the mining sector and to regulate the mining industry is potentially contradictory.[96]

While these submissions helped inform the Board's understanding of the issues surrounding regulation of Victorian coal mines, a broader examination into the role of the Mining Regulator is beyond the Terms of Reference of this Inquiry.

OVERSIGHT BY THE VICTORIAN WORKCOVER AUTHORITY

VWA's principal responsibilities include facilitating the avoidance or prevention of work place injuries and enforcing compliance with Victoria's OHS laws.[97]

VWA has a team of more than 450 field officers, investigators, work-site technical experts and support staff, spread throughout a network of city, suburban and regional offices. This team is responsible for improving workplace safety through implementing VWA's comprehensive constructive compliance strategy, which focuses on information and education, incentives, enforcement, investigations, prosecutions and penalties.[98]

Since 1 January 2008, VWA has had a specialised unit dedicated to regulation of mines and quarries, known as the Earth Resources Unit.[99]

Mr Neist explained how VWA prioritises its attention and resources as follows:

> The VWA has regulatory oversight over approximately 250,000 worksites throughout Victoria. Through a risk-based approach, VWA seeks to achieve the best impact by allocating its resources to focus on workplace hazards identified as having the greatest potential for harm. As a regulator that employs a risk-based approach to compliance and enforcement, VWA utilises a risk prioritisation that balances historical and emerging risk and the consequences of risk to direct attention and resources to health and safety risks that have the greatest potential for injury and harm.
>
> To ensure that VWA allocates and utilises its resources in the most effective and efficient way, VWA prioritises its interventions in areas where they have the greatest impact on controlling and reducing risk and hence on improving workplace safety.[100]

Mr Robert Kelly, the Manager of the Earth Resources Unit of VWA, explained to the Board that VWA does not have the resources to make effective interventions in relation to every risk in every Victorian workplace; therefore a targeted approach is adopted.[101]

Mr Kelly stated that:

> VWA monitors the duty holder's compliance with their statutory obligations to assess the potential exposure to major mining hazards and provide control measures to prevent or mitigate against such incidents, through the following means:
>
> a. risk ranking prioritisation of mine sites
>
> b. an annual verification process of the highest 12 risk ranked sites
>
> c. oversight inspections
>
> d. incident response and service requests
>
> e. accessible guidance materials concerning what constitutes compliance
>
> f. stakeholder engagement.
>
> In addition to the matters listed above, VWA monitors specific compliance with the OHS Act and Regulations via incident notifications, statutory notices, reviewing aspects of Safety Management Systems and Safety Assessments and confirming the mine's Emergency Plan has been developed in conjunction with the Emergency Services and the local municipal council.[102]

Since late 2010, VWA has also conducted annual verification inspections for the 12 mines ranked as having the highest risk (including the Hazelwood mine). The purpose of the annual verification is 'to monitor the duty holders' compliance with their statutory obligations to assess the potential for major mining incidents and to provide control measures to prevent or mitigate against such incidents.'[103]

The Latrobe Valley mines are visited by VWA inspectors on average once or twice per month. This includes pre-planned 'priority visits', four to five oversight inspections per year (which deal with particular topics such as batter stability, maintenance or vehicle interaction), and occasional follow-up visits arising from specific incidents or statutory notices issued on mine operators.[104]

VWA identifies a particular focus for the verification process each year. For example, in 2012, the focus of verification inspections was mine fires (arising from operational plant).[105] This focus was chosen following a fire on a dredger at the Hazelwood mine on 21 January 2012.[106]

VWA classifies mining incidents as being serious, significant or minor (see Figure 3.4 below).

Figure 3.4 Victorian WorkCover Authority classification of mining hazard incidents[107]

Serious	• Potential for a mining hazard incident through the failure of major mining hazard incident controls • Potential for a fatality
Significant	• The failure of major mining hazard incident controls did not have the potential for a fatality • The injury did require or could have required admission to hospital
Minor	• The failure of major mining hazard incident controls did not have the potential for hospitalisation • The injury or potential for injury did not require, or was unlikely to require, hospitalisation

VWA monitoring activities are centred on 'major mining hazards', that is, hazards that carry a significant risk of causing more than one death. Mr Kelly explained how this approach determines the focus of inspections at the Hazelwood mine:

> In selecting the particular focus for inspections at Hazelwood, the VWA has identified those major mining hazards that pose the greatest risk of more than one fatality. This in turn leads to decisions as to what activities and areas of the mine are observed or inspected. Inevitably this will be the operational areas of the mines where employees have the greatest exposure to harm from known hazards. While the previously worked areas of the mine (batters and mine floor) are entered by employees/contractors to undertake periodic activities including inspection or maintenance work, the risk of one-off catastrophic incidents is significantly reduced compared to active areas of coal extraction. For that reason, directing resources away from the operational areas of the mine to the previously worked areas could not be justified from an occupational health and safety risk oversight perspective.[108]

Mr Kelly gave evidence to the Board that from 1 January 2008 (when VWA assumed responsibility for the oversight of OHS compliance in the mining sector) to 9 February 2014 (when the Hazelwood mine fire commenced), there were four fires at the Hazelwood mine that VWA classified as 'significant', but none that were classified as 'serious'.[109]

Of the four significant fires, 'the first occurred when fire broke out in disused batters in a non-operational part of the mine; the second, involved a flash fire in an item of plant; the third involved a fire on a dredger; and the fourth involved burns to an employee who was refuelling a compressor.'[110] Each of these incidents was notified to VWA in accordance with s. 38 of the OHS Act and follow up action was taken by VWA.[111]

The Inquiry focussed primarily on the first of these four fires on 14 September 2008, as this involved a fire that broke out in the worked out areas in the south-east corner of the mine. VWA inspectors attended the site on 15 September 2008 to inspect, observe and make enquiries into arrangements for workers in buildings affected by the fire smoke, and the use of carbon monoxide monitors. VWA also received notification from the CFA that two firefighters were overcome by smoke and carbon monoxide.[112]

A VWA inspector attended the Hazelwood mine again on 16 September 2008 to follow up the reported incident and discuss the monitoring and testing of carbon monoxide. The inspector noted that the monitoring and testing appeared to be working well, and was advised that the firefighters had both been released from hospital and were in good health.[113]

On 22 September 2008, a VWA inspector, a senior mining engineer, and a principal safety analyst, conducted a further follow-up visit at the Hazelwood mine. During this visit, VWA was informed that, except for a few hot spots, the fire had been extinguished and that an environmental and engineering consultancy firm, GHD Consulting Pty Ltd, had been contracted to investigate the fire incident.[114]

The report ultimately produced by GHD Consulting Pty Ltd is discussed in further detail in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez. The report recommended, among other things, that: '[a] risk assessment should be undertaken on the non-operational areas to determine if further prevention work is required. The risk assessment should include a Cost/Benefit Analysis.'[115]

VWA did not request a copy of the GHD report and as a result was not in a position to monitor whether any of the recommendations made in that report were implemented at the Hazelwood mine.[116]

The Board heard from Mr Hayes, a VWA Inspector based in Traralgon whose work primarily involves supervision of the three open cut mines in the Latrobe Valley.[117]

Mr Hayes was the lead inspector for the annual verification inspection of the Hazelwood mine in 2012, when the subject of that year's investigations was mine fire (operational plant). The inspection was conducted on 20 and 21 June 2012.[118]

Mr Hayes issued two improvement notices arising out of the verification inspection. The first required the duty holder to conduct a comprehensive and systematic Safety Assessment in order to assess the risks associated with the major mining hazard 'mine fires'. The second required the duty holder to provide and maintain a safe system of work associated with the use of firefighting equipment on a dredger.[119]

The first improvement notice is relevant to the question of whether GDF Suez was compliant with r. 5.3.23 of the OHS Regulations and is discussed in further detail in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez.

In the Safety Assessment improvement notice, Mr Hayes noted that:

- A report titled 'International Power Hazelwood - Report for Major Mining Hazards Assessment, Interim Submission' dated December 2009 recommended that 'risk assessments are to be carried out for each of the scenarios for the MMHs [major mining hazards] illustrating that risk has been reduced to as low as reasonably practicable.'
- The operator of the Hazelwood mine informed him that the risk assessments contemplated by the 2009 report had not been finished.
- The Safety Assessment documentation relating to 'mine fires' he observed was incomplete and unfinished.
- 'If a mine fire was to occur whilst employees are performing duties within the mine, the fire has the potential to cause an incident that would pose a significant risk of causing more than one death due to asphyxiation or burns.'
- 'A failure to assess the risks associated with the Major Mining Hazard Mine Fires and to conduct a comprehensive and systematic Safety Assessment in accordance with regulation 5.3.23, may lead to hazards and failure scenarios not being identified and risk control measures not being implemented, thus exposing employees to a mine fire. A mine fire has the potential to result in multiple fatalities.'[120]

On 8 October 2012, Mr Hayes conducted a follow-up visit in relation to the Safety Assessment improvement notice and found that:

- The Safety Assessment had been reviewed and risk assessments for each scenario had been conducted.
- It was management's belief that the risk associated with each scenario as documented within the 'bow-tie diagram'[121] for the Safety Assessment for mine fires was as low as reasonably practicable.
- Management had identified 'new causes' that had also been added to the assessment.
- Information relating to control measures as documented in the Safety Assessment appeared to have been completed.[122]

Mr Hayes told the Board that he considered that GDF Suez had complied with the improvement notice.[123]

Counsel Assisting questioned whether the Safety Assessment relating to mine fires conducted by GDF Suez had addressed the matters in rr. 5.3.23(4)(c)-(e) of the OHS Regulations.[124] Mr Hayes told the Board that during the verification inspection of the Hazelwood mine in June 2012, he had not tested GDF Suez's Safety Assessment documentation against every requirement contained in r. 5.3.23, but rather was focused on the actual issues raised in the improvement notice.[125] According to the VWA entry report completed by Mr Hayes on 8 October 2012, the VWA considered it sufficient that GDF Suez management believed the risks were as low as reasonably practicable.[126]

DISCUSSION AND CONCLUSIONS

ROLE OF THE MINING REGULATOR

Prior to 1 January 2008, the Mining Regulator appeared to take a proactive approach to its monitoring of fire incidents at the Hazelwood mine, as exemplified by its response to the November 2003 and October 2006 fires. This is notwithstanding that none of these incidents caused any serious injuries.[127]

The Mining Regulator's position concerning its current responsibility for preventing and mitigating the risk of fire in open cut mines is clear: 'we don't regulate fire.'[128] According to Ms White, this has been the case since 1 January 2008,[129] noting that the requirement to address health and safety in work plans actually remained until 30 June 2010.[130]

In light of the impacts of the Hazelwood mine fire felt by the Morwell community, the Mining Regulator's position appeared inconsistent with the objectives of the Mineral Resources Act, which include ensuring that 'the health and safety of the public is protected in relation to work being done under a licence.'[131]

Ms White suggested that the Mining Regulator was prevented from fulfilling those objectives in relation to the likelihood of a fire igniting in the Hazelwood mine primarily due to the 'prescriptive approach' of the mine licensing regime, in particular the prescriptive nature of information that must be included in a work plan under Schedule 15 of the Mineral Industries Regulations.[132]

Ms White's interpretation of the Mining Regulator's powers under the Mineral Resources Act and Mineral Industries Regulations is a narrow one.

Schedule 15 of the Mineral Industries Regulations sets out the prescribed information a work plan must contain under s. 40(3)(a) of the Mineral Resources Act. It does not limit the matters that a work plan, rehabilitation plan, or community engagement plan within a work plan, may contain.

The matters that a rehabilitation plan must address under s. 79 of the Mineral Resources Act are not exhaustive. The enabling provisions listed in Schedule 15 are also not expressed to be exhaustive, nor is there any statutory requirement that the Department Head must approve or vary a work plan containing all of the information listed in Schedule 15.

The Department Head and the Mining Regulator, as the Minister's delegate, are granted broad discretion in determining whether to approve mining licences, work plans and work plan variations. The Minister or the Department Head may impose conditions in respect of a mining licence or work plan variation in relation to a range of matters, such as protection of the environment and community facilities, which are broad enough concepts to encompass risks associated with mine fires.[133]

The position adopted by Ms White is not, in the view of the Board, the only interpretation open of the Mining Regulator's regulatory power in respect of fire prevention under the Mineral Resources Act or related regulations. None of these regulatory instruments expressly and unambiguously excise fire from the public safety matters the Mining Regulator is entitled to take into account in exercising its powers. This is particularly so having regard to the broad public safety related objective of the Mineral Resources Act as expressed in s 2(b)(vii).

That VWA was also responsible for overseeing the risk of fire at the Hazelwood mine did not absolve the Mining Regulator from having any role to play. The current Memorandum of Understanding exists precisely because the agencies have overlapping responsibility. In practice, certain issues have attracted

the attention of both agencies. For example, the Mining Regulator considered itself responsible for addressing public safety issues arising from stability issues in the northern batters of the Hazelwood mine (an issue that must be specifically addressed in work plans for certain mines),[134] notwithstanding that VWA also took an interest in that area insofar as it affected workplace safety.[135]

The Board does not accept that after 1 January 2008 the Mining Regulator no longer had any statutory power, either through the mine licensing or work plan approval process, to address issues relating to the risk of fire at the Hazelwood mine.

The Mining Regulator, like VWA, failed to recognise that fire was a hazard that not only had the potential to affect the health and safety of employees, but also the Morwell community. This may account for why the Mining Regulator did not consider itself responsible for overseeing fire risks in the Hazelwood mine. This residual risk associated with public safety was not identified during the transitional arrangements in place between 2006 and 2008, nor as part of Deloitte's audit of the transition of responsibility for OHS from the Mining Regulator to VWA in June 2008.

However, the Mining Regulator was nonetheless aware that a fire at the Hazelwood mine could affect public safety. As noted in Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez, the potential effects of a mine fire on surrounding land and the Morwell community were recognised by the panel commissioned to assess the environmental effects statement forming part of the 2009 work plan variation for the Hazelwood mine.[136] As Environment Victoria submitted, the Mining Regulator must be taken to have knowledge of this report.[137] Further, the Mining Regulator was aware that rehabilitation of worked out areas was an effective means of preventing the outbreak of fire at an open cut mine.[138] It was therefore in a position to directly influence at least one measure GDF Suez could adopt to address fire risk.

The fact remains that the Mining Regulator does not consider itself to have the powers necessary to enforce measures directed to the prevention and mitigation of fire in mines. Further, there was also evidence that the Mining Regulator does not presently have the necessary expertise to effectively oversee this area.[139]

ROLE OF VICTORIAN WORKCOVER AUTHORITY

VWA's role in regulating mine fires that have the potential to affect the health and safety of the public is necessarily constrained by the reach of s. 23 of the OHS Act. That section is limited to risks that arise from the conduct of the undertaking of an employer.

Mr Neist provided an opinion to the Board that the Hazelwood mine fire did not arise from the conduct of the mine operator's undertaking. The Board does not agree. The Board accepts that a fire in the worked out areas of the Hazelwood mine is a risk that could arise from the conduct of the undertaking and might therefore fall with the scope of s. 23.

The Board was concerned by two aspects of VWA's oversight of fire prevention and mitigation practices at the Hazelwood mine:

- the failure to monitor GDF Suez's response to the recommendations in the 2008 GHD report
- the manner in which VWA examined the adequacy of the Safety Assessment relating to mine fires conducted by GDF Suez.

VWA did not request a copy of the GHD report in relation to the September 2008 fire at the Hazelwood mine. As a result, VWA was not in a position to monitor whether any of the recommendations made in that report were implemented at the Hazelwood mine. For the purposes of the Inquiry, the key recommendation in that report was that a risk assessment should be conducted on the 'non-operational' areas of the Hazelwood mine to determine whether further prevention work was required. That did not happen. As noted by Counsel Assisting, this was 'most unfortunate as it represents a lost opportunity.'[140]

The Board notes that VWA monitoring activities summarised by Mr Hayes and Mr Kelly are limited to 'serious' incidents and 'major mining hazards,' that is incidents and hazards that carry a significant risk of causing more than one death. Similarly, VWA focuses on investigating mining incidents that are classified as 'serious', ie incidents that have the potential to result in a fatality. This is consistent with the broad VWA strategy of targeting its interventions in the areas where it can have the greatest impact on workplace safety.

The Victorian Government submitted that the failure to monitor the mine operator's response to the September 2008 incident was justifiable on the basis that it was not a 'major mining hazard' and it was:

> …therefore appropriate for the VWA to leave responsibility for the implementation of the 2008 GHD report with the entity responsible for implementing it, GDF Suez and, instead, focus its regulatory resources on ensuring that GDF Suez had appropriate systems for dealing with major mining hazards.[141]

The Board does not agree with this submission.

VWA's approach in relation to the September 2008 fire stands in stark contrast to the Mining Regulator's oversight of GDF Suez's implementation of recommendations arising out of the October 2006 fire, which led to a wholesale review of the Fire Service Policy and Code of Practice at the Hazelwood mine. VWA representatives had already conducted at least three inspections following the September 2008 incident. During one of these inspections, VWA was made aware of the GHD report.[142] Given that VWA was already actively following up on the incident, it would not have required significant additional resources to have requested a copy of the report or to make enquiries with GDF Suez as to what it had intended to do in response to the recommendations suggested.

Mr Neist agreed that it is appropriate for VWA to monitor what a duty holder is doing in response to recommendations arising out of an incident, and that it is necessary for VWA to obtain a copy of an incident report in order to carry out this function.[143] Mr Neist's comments were not confined to 'major mining hazards'. His only explanation for why a copy of the report was not sought following the September 2008 fire was that this incident occurred early in VWA's tenure as the regulator (some nine months later).[144]

It is apparent from Mr Hayes' evidence that during the verification inspection of the Hazelwood mine in June 2012, VWA was primarily focused on ensuring that GDF Suez's Safety Assessment documentation was complete, rather than whether the Safety Assessment had adequately addressed the risk of fire at the Hazelwood mine.

In its submission to the Board, the Victorian Government stated that the manner in which VWA conducted its verification inspection in 2012 must be viewed in the context of other evidence before the Board suggesting that the Safety Assessment did satisfy the requirements of r. 5.3.23.[145] The Board agrees. However, the Board is concerned that VWA placed undue focus on administrative or procedural compliance with the OHS Regulations, rather than ensuring substantive compliance. The Board considers that effective regulation must focus on substance rather than form.

The Board recognises the principle underlying the regulatory regime that the primary obligation to manage risk at a site rests with the duty holder.[146] It also recognises that there are necessary constraints on how a government agency can allocate its resources. However, the Hazelwood mine fire has demonstrated that there are consequences of real import where the approach to regulation is overly passive. As noted by Environment Victoria in its submission to the Board:

> The 'hands-off' approach has created a leadership vacuum of real consequence. By leadership we mean (at least) taking responsibility for asking whether the consequences of the mining operation are addressed in a way that adequately protects the community in both the short and long term and for ensuring that real protections are in place.[147]

TRANSFER OF OCCUPATIONAL HEALTH AND SAFETY RESPONSIBILITY

The Board notes with concern some of the evidence it heard relating to the transition of responsibility for the administration and enforcement of the OHS regime in respect of mines from the Mining Regulator to VWA.

In particular, the large scale transfer of staff from the Mining Regulator to VWA that was recommended by the 2006 Pope report did not occur. Secondly, contrary to the findings of the 2008 Deloitte audit, Mr Hayes told the Board he did not have access to files of the Mining Regulator in relation to the Hazelwood mine before 1 January 2008.

The Victorian Government sought to address these concerns by suggesting:

- In 2008 it was considered preferable to recruit new staff rather than force Mining Regulator staff to transfer to VWA.
- VWA was able to access Mining Regulator files if it requested them.[148]

Regrettably, this was new evidence that was not put before the Board during its public hearings. Ms White's and Mr Hayes' evidence on these matters on the other hand was both unequivocal and unchallenged.

The Board acknowledges that the Deloitte audit found that there was an effective transfer of mining industry expertise and knowledge from the Mining Regulator to VWA, but notes these conclusions were formed on the basis of discussions with staff employed by the Mining Regulator and not VWA.[149] There remains a real possibility that expertise and knowledge relevant to assessing fire risk at the Hazelwood mine was lost as a result of the transfer of OHS responsibility from the Mining Regulator to VWA.

IS THERE A REGULATORY GAP?

Depending on the interpretation of the legislation adopted, there may not in fact be any gap in the statutory framework itself. In the Board's view, both VWA and the Mining Regulator had statutory powers enabling them to influence and enforce compliance with fire prevention practices at the Hazelwood mine.

However, both agencies adopted a narrow reading of the statutory regime underlying their respective areas of responsibility which resulted in a real practical gap in regulation of the Hazelwood mine. Mr Neist acknowledged the existence of this gap and the need to fill it.[150]

Mr Neist's evidence that a fire in the worked out areas of the Hazelwood mine did not arise from the 'conduct of the undertaking' and therefore fell outside of the scope of VWA's regulatory reach is troubling. If this view is accepted, on the evidence of both Mr Neist and Ms White, the prevention of fires such as the Hazelwood mine fire would lie outside the regulatory oversight of either government agency.

The Board does not accept Mr Neist's views, nor do they represent the considered opinion of VWA, with the result that the regulatory gap is narrower than it might have otherwise been.[151]

In the Board's view, both the VWA and the Mining Regulator had statutory powers enabling them to influence and enforce compliance with fire prevention practices at the Hazelwood mine. However, regulation of the mine was undermined by:

- the silo mentality adopted by the Mining Regulator and VWA in carrying out their functions
- the passivity with which each agency has pursued its supervision of the Hazelwood mine by shifting complete responsibility for dealing with fire risk to GDF Suez.[152]

As noted by Environment Victoria in its written submission to the Board:

> While regulators must be conscious of the limits of their regulatory jurisdiction, the segregation of fire risk from mining operations (including rehabilitation) has been absolute and inflexible, and has had the consequence that no agency has considered risk holistically.[153]

The Memorandum of Understanding between the Mining Regulator and VWA attempts to recognise areas of overlapping responsibility and define each agency's role in regulating each area.

If the Mining Regulator and VWA had approached their respective roles in the consultative manner contemplated by the Memorandum of Understanding, this may have resulted in overlapping responsibilities, but as noted by Counsel Assisting, 'that is far preferable to there being a gap.'[154]

The risk of fires like the Hazelwood mine fire that occurred in February and March 2014 slipped through the cracks between regulatory agencies. This reality must be confronted if similar incidents are to be avoided in the future.

OPPORTUNITIES FOR ENHANCING THE REGULATORY REGIME

In light of VWA's emphasis on 'major mining hazards', it is doubtful that this agency is best equipped to address risks that have the potential to affect the health and safety of the public, particularly if it is the only agency with any oversight of this issue. Under the VWA incident classification scale, it would be open for the agency to consider the Hazelwood mine fire as a 'minor' incident and would therefore rank very low in targeting its resources. Following its experience with the Hazelwood mine fire, the Morwell community could be forgiven if it took issue with treating large scale fires in the worked out areas of the Hazelwood mine as 'minor'.

The Board considers that the Mining Regulator and VWA both have a role in regulating fire risk in the Victorian mining sector. The mine licensing regime is a potentially powerful tool for influencing the way in which mine operators manage risks that could impact on the public. If the Mining Regulator shared responsibility for regulating fire risk, this role would fit squarely within the legislative intent of the mine licensing regime. The Mining Regulator is not confident that it has a sufficient statutory basis to fulfil this role.

The present uncertainty concerning the scope of the Mining Regulator's statutory powers and area of responsibility might be resolved when s. 16 of the Mineral Resources Amendment Act comes into operation.

The approach of the new Act is appropriate because it requires the licensee to identify risk and specify measures to eliminate or reduce that risk as far as reasonably practicable. This is consistent with the manner in which fire is regulated under the OHS regime. It should enable the Mining Regulator and VWA to approach their respective regulatory tasks consistently.[155]

Environment Victoria submitted that in order to effectively fulfil their shared responsibilities, the Mining Regulator and VWA need to be adequately equipped with staff that have the necessary fire expertise to monitor and enforce compliance with measures to mitigate fire risk.[156] The Board agrees. Ms White made it clear that the Mining Regulator does not currently have this capability. Mr Neist also identified that the lack of systems safety specialists to judge whether risks are being properly controlled is a key shortcoming in the skillset of the Earth Resources Unit of the VWA and indicated he would look to bolster the Unit with that expertise.[157] It is appropriate that both regulators were receptive to adding this kind of experience and expertise to their teams.

The Board affirms the willingness of the Mining Regulator to explore its potential role following the commencement of s. 16 of the Mineral Resources Amendment Act.

The Board notes the public concern about whether rehabilitation of exposed batters could have prevented the ignition or the spread of fire in the mine and acknowledges that the concern is legitimate and warrants further consideration.

Environment Victoria suggested amendment be made to Schedule 15 of the Mineral Industries Regulations to specifically require that 'rehabilitation plans included within work plans for a mining licence must include consideration of the means by which progressive rehabilitation may mitigate fire risk.'[158] Professor Hepburn also emphasised the importance of effective monitoring and enforcement of rehabilitation plans (particularly progressive rehabilitation obligations) to improve public safety standards and minimise the risk of fire, and she suggested public recording of all rehabilitation plans (final and progressive).[159]

Ms White welcomed the potential for enhancement of the Mining Regulator's powers to include rehabilitation specifically for the purposes of fire risk and the possibility of collaborating with other agencies, such as VWA, to strengthen the regulation of mines.[160] Opportunities for collaboration between the Mining Regulator and VWA already exist whenever a mine fire is notified to either the VWA or the Chief Inspector of Mines, or when each of the agencies undertake inspections of the mines, but currently very little collaboration appears to take place.

While Environment Victoria's suggestion might be one way in which work plans could address issues of fire prevention, mitigation and suppression in mines, it is not appropriate for the Board to pre-empt or prescribe precisely how work plans should address these issues, nor the regulatory means by which this will be effected. This is ultimately a matter for the Victorian Government in consultation with the Mining Regulator and other stakeholders.

This is particularly the case having regard to recommendation 19 of the 2012 report of the Economic Development and Infrastructure Committee which led to the outcomes-based focus of s. 16 of the Mineral Resources Amendment Act.

The Victorian Government, while it did not commit to fire control measures being required under work plans, did not suggest that there was any practical or policy-based obstacle to doing so and appeared open to the possibility.[161]

Section 16 of the Mineral Resources Amendment Act may not come into operation until 31 December 2016.[162]

Counsel Assisting submitted to the Board that '[t]he people of the Latrobe Valley and Morwell in particular are entitled to see any regulatory gap closed at the earliest opportunity' and encouraged the Victorian Government to consider bringing forward the commencement date.[163] This submission was also supported by Environment Victoria.[164]

The Victorian Government has noted several administrative hurdles before s. 16 can come into operation. These include:

- It will be necessary to amend the regulations in order to ensure the regulations are consistent with and complement the amended provisions of the Mineral Resources Act.
- If fire risk control measures are to become part of work plans, further legislative amendments may be required.
- A regulatory impact statement will also need to be prepared, which may take 12 to 18 months to complete.[165]

The Board considers that if the commencement date is brought forward to 31 December 2015, there should still be sufficient time to make any necessary amendments to the regulations and enabling legislation, as well as to prepare the necessary regulatory impact statement. The Victorian Government is encouraged to bring forward this date further if the preparatory steps identified above progress more quickly than anticipated.

Once s. 16 does come into force, it is unclear whether existing work plans will need to be revised to meet the new requirements.[166] Ms White informed the Board that there will be a transitional phase.[167] Nevertheless, the Victorian Government has urged industry, in particular licensees of all Victorian coal mines, to prepare for the inevitable changes.[168]

On 14 January 2014, GDF Suez applied to again vary the work plan for the Hazelwood mine, which will involve proposed changes to the western boundary of the north field of the mine and mining sequencing and batter rehabilitation.[169] There was no evidence before the Board regarding the likely timeframe for the work plan variation process. Based on previous work plan variations, it is possible that s. 16 of the Mineral Resources Amendment Act will have become operational before approval of the work plan variation is complete.

Accordingly, the current work plan variation application presents an opportunity for both GDF Suez and the Mining Regulator to ensure the work plan conforms to the requirements of s. 16 of the Mineral Resources Amendment Act, and sufficiently addresses the risk of fire in the worked out areas of the Hazelwood mine.

RECOMMENDATION 4

The State:

- bring forward the commencement date of s. 16 of the *Mineral Resources (Sustainable Development) Amendment Act 2014* (Vic), to facilitate the requirement that approved work plans specifically address fire prevention, mitigation and suppression; and
- acquire the expertise necessary to monitor and enforce compliance with fire risk measures adopted by the Victorian coal mining industry under both the mine licensing and occupational health and safety regimes.

1. *Mineral Resources (Sustainable Development) Act 1990* (Vic), s. 1
2. *Mineral Resources (Sustainable Development) Act 1990* (Vic), s. 2(b)(vii)
3. Written submission of the Victorian Government, 22 May 2014, para. 3.34; Exhibit 59 – Statement of Kylie White, para. 21
4. Written submission of the Victorian Government, 22 May 2014, para. 3.37
5. The provision for the requirement of a work authority (in place of an authority to commence work) was first introduced in the amendments to the *Mineral Resources (Sustainable Development) Act 1990* (Vic) in 2000, which post-dated the authority to commence in respect of the Hazelwood mine, which was approved on 10 September 1996; Written submission of the Victorian Government, 22 May 2014, para. 3.55
6. Exhibit 59 – Statement of Kylie White, para.13
7. Written submission of the Victorian Government, 22 May 2014, para. 3.23
8. Including conditions set out in s. 26(2) of the *Mineral Resources (Sustainable Development) Act 1990* (Vic); Written submission of the Victorian Government, 22 May 2014, para. 3.36
9. Written submission of the Victorian Government, 22 May 2014, para. 3.41
10. *Mineral Resources (Sustainable Development) Act 1990* (Vic), s. 40(6)
11. *Mineral Resources (Sustainable Development) Act 199*0 (Vic), ss. 26(2) & 41(5A)
12. Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic), r. 32(1)(b)(i)
13. Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic), rr. 44-45 & Schedule 15; Written submission of the Victorian Government, 22 May 2014, para. 4.27
14. See for example, Exhibit 59 – Statement of Kylie White, para. 100; annexure KAW-23, p. 203
15. White T1616:21-28
16. Written submission of Samantha Hepburn, p. 2
17. *Mineral Resources (Sustainable Development) Act 1990* (Vic), s. 78(1)
18. *Mineral Resources (Sustainable Development) Act 1990* (Vic), ss. 79A & 80
19. *Mineral Resources (Sustainable Development) Act 1990* (Vic), s. 39A
20. *Mineral Resources (Sustainable Development) Act 1990* (Vic), s. 41AC; Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic), r. 33(2)
21. White T1583:7-21
22. Exhibit 59 – Statement of Kylie White, para. 183
23. *Mineral Resources (Sustainable Development) Amendment Act 2014* (Vic), s. 2(3)
24. *Occupational Health and Safety Act 2004* (Vic), s. 2(1)(a)-(b)
25. *Occupational Health and Safety Act 2004* (Vic), s. 2(1)(c)
26. *Occupational Health and Safety Act 2004* (Vic), s. 4(1)-(3)
27. Exhibit 70 – Statement of Leonard Neist, paras 11 & 12
28. *Occupational Health and Safety Act 2004* (Vic), s. 21(3)(a)
29. *Occupational Health and Safety Act 2004* (Vic), s. 20(1)
30. Exhibit 70 – Statement of Leonard Neist, para. 22
31. Exhibit 96 – How WorkSafe applies the law in relation to Reasonably Practicable, WorkSafe Position Edition No. 1 November 2007
32. Neist T1862:1 – T1863:4; T1870:14 – T1871:16
33. Neist T1835:13-15
34. Neist T1872:1-2
35. Occupational Health and Safety Regulations 2007 (Vic), r. 1.1.7
36. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.2(1)(j)
37. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.7(2)
38. Written submission of the Victorian Government, 22 May 2014, para. 3.70; Exhibit 31 – Statement of Robert Kelly, para. 5; Hayes T1750:30 – T1751:10
39. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.23(3)(b)
40. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.22
41. Occupational Health and Safety Regulations 2007 (Vic), r. 1.1.5
42. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.23(1)-(2)
43. Occupational Health and Safety Regulations 2007 (Vic), r. 5.3.23(4)
44. Exhibit 59 – Statement of Kylie White, para. 14
45. Exhibit 59 – Statement of Kylie White, para. 57
46. Exhibit 59 – Statement of Kylie White, para. 59; Mineral Resources Development Regulations 2002 (Vic) (repealed), r. 25(2); Schedule 13 cl. 8
47. Exhibit 59 – Statement of Kylie White, para. 60; annexures KAW-13 & KAW-14
48. Exhibit 59 – Statement of Kylie White, para. 61; annexure KAW-15, pp. 122 & 123
49. Exhibit 59 – Statement of Kylie White, para. 79
50. Exhibit 59 – Statement of Kylie White, paras 62 & 67
51. Exhibit 59 – Statement of Kylie White, para. 77; annexure KAW-19
52. Exhibit 59 – Statement of Kylie White, para. 55
53. Mineral Resources Development Regulations 2002 (Vic) (repealed), r. 25(2) & Schedule 13 cl. 8
54. Mineral Resources Development (Mining) Amendment Regulations 2010, r. 9; Exhibit 59 – Statement of Kylie White, para. 78

55. *Energy and Resources Legislation Amendment Act 2010* (Vic), s. 55; Exhibit 59 – Statement of Kylie White, para. 78
56. *Mineral Resources (Sustainable Development) Act 1999* (Vic), s. 41AC; Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic), r. 33(2); *Energy and Resources Legislation Amendment Act 2009* (Vic), s. 27
57. Exhibit 59 – Statement of Kylie White, paras 68-76; annexure KAW-18
58. Exhibit 59 – Statement of Kylie White, annexure KAW-18, p. 9
59. Hayes T1767:30 – T1768:4
60. Third written submission of the Victorian Government, 23 June 2014, paras 121 & 122
61. Third written submission of the Victorian Government, 23 June 2014, para. 120
62. Exhibit 59 – Statement of Kylie White, annexure KAW-18, p. 8
63. Exhibit 59 – Statement of Kylie White, annxure KAW-18, p. 4
64. Exhibit 59 – Statement of Kylie White, paras 80 & 84; Exhibit 70 – Statement of Leonard Neist, para. 7
65. Exhibit 59 – Statement of Kylie White, para. 81; annexure KAW-20, Schedule 1, p. 1
66. White T1600:2 – T1601:4
67. White T1602:10-1
68. Neist T1825:10 – T1826:5
69. Neist T1817:27 – T1818:5
70. Third written submission of the Victorian Government, 23 June 2014, para. 126
71. Written submission of Counsel Assisting, 17 June 2014, section 4.1, para. 21, citing *Whittaker v Delmina Pty Ltd* (1998) 87 IR 268 (VSC, Hansen J); *R v Associated Octel Ltd* [1996] 4 All ER (HL); *R v Mara* [1987] 1 All ER 478
72. Third written submission of the Victorian Government, 23 June 2014, para. 127
73. Neist T1855:31 – T1856:10
74. Exhibit 59 – Statement of Kylie White, paras 19 & 20
75. Exhibit 59 – Statement of Kylie White, para. 121
76. White T1620:1-17
77. Exhibit 59 – Statement of Kylie White, para. 137
78. Exhibit 59 – Statement of Kylie White, paras 138-172
79. Exhibit 59 – Statement of Kylie White, paras 148 & 149
80. Exhibit 59 – Statement of Kylie White, paras 158-167
81. Exhibit 59 – Statement of Kylie White, para. 172
82. White T1607:24-25
83. Exhibit 59 – Statement of Kylie White, paras 55 & 56
84. White T1594:3-10
85. Exhibit 59 – Statement of Kylie White, para. 188
86. White T1641:3-10
87. White T1640:6-24
88. Exhibit 59 – Statement of Kylie White, para. 179; White T1608:5-9
89. Exhibit 59 – Statement of Kylie White, para.181
90. Third written submission of the Victorian Government, 23 June 2014, para. 130
91. Second written submission of Environment Victoria, 24 June 2014, para. 72
92. Exhibit 59 – Statement of Kylie White, paras 184-186
93. White T1639:6-10
94. Exhibit 59 – Statement of Kylie White, para. 186
95. Written submission of David Langmore, para. 2.13
96. Written submission of Environmental Justice Australia
97. Exhibit 70 – Statement of Leonard Neist, para. 8
98. Exhibit 70 – Statement of Leonard Neist, p. 1
99. Hayes T1745:15-19
100. Exhibit 70 – Statement of Leonard Neist, paras 9 & 10
101. Exhibit 31 – Statement of Robert Kelly, para. 13
102. Exhibit 31 – Statement of Robert Kelly, paras 7 & 8 (emphasis added)
103. Exhibit 31 – Statement of Robert Kelly, para. 10; Hayes T1753:23-29
104. Hayes T1749:6 – T1750:6
105. Exhibit 31 – Statement of Robert Kelly, para. 12
106. Exhibit 31 – Statement of Robert Kelly, para. 34; Exhibit 67 – Statement of Kevin Hayes, para. 5
107. Adapted from Exhibit 31 – Statement of Robert Kelly, para. 18
108. Exhibit 31 – Statement of Robert Kelly, paras 14 & 15
109. Exhibit 31 – Statement of Robert Kelly, paras 17 & 19
110. Exhibit 31 – Statement of Robert Kelly, para. 20
111. Exhibit 31 – Statement of Robert Kelly, para. 21
112. Exhibit 31 – Statement of Robert Kelly, paras 22 & 23

113. Exhibit 31 – Statement of Robert Kelly, para. 24
114. Exhibit 31 – Statement of Robert Kelly, para. 25
115. Exhibit 93 – Statement of Romeo Prezioso, annexure 3, p. 15
116. Neist T1840:29 – T1841:3
117. Hayes T1749:4-5
118. Exhibit 67 – Statement of Kevin Hayes, paras 3 & 5
119. Exhibit 67 – Statement of Kevin Hayes, para. 5; attachment 19
120. Exhibit 67 – Statement of Kevin Hayes, attachment 19, pp. 278 & 279
121. A bow-tie diagram is a diagrammatic representation commonly used in risk assessments that identifies the causes, outcomes and risk controls for a particular hazard. For an illustration and further information, see Chapter 3.3 Fire prevention and mitigation measures taken by GDF Suez
122. Exhibit 67 – Statement of Kevin Hayes, attachment 20, p. 120
123. Exhibit 67 – Statement of Kevin Hayes, para. 5
124. Written submission of Counsel Assisting, 17 June 2014, Part 5.3, para. 31
125. Hayes T1776:24 – T1777:6
126. Exhibit 67 – Statement of Kevin Hayes, attachment 20, p. 120
127. Exhibit 59 – Statement of Kylie White, paras 156 & 157
128. White T1607:24-25
129. Exhibit 59 – Statement of Kylie White, para. 55
130. Mineral Resources Development (Mining) Amendment Regulations 2010, r. 9; Exhibit 59 – Statement of Kylie White, para. 78
131. *Mineral Resources (Sustainable Development) Act 1990* (Vic), s. 2(b)(vii)
132. Exhibit 59 – Statement of Kylie White, para. 179; White T1636:27 – T1637:14
133. *Mineral Resources (Sustainable Development) Act 1990* (Vic), ss. 26(2) & 41(5A)
134. Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic), Schedule 15, Pt. 2
135. White T1600:18 – T1601:4; T1601:27 – T1602:9
136. Exhibit 59 – Statement of Kylie White, para. 100; annexure KAW-23, p. 203
137. Second written submission of Environment Victoria, 24 June 2014, para. 68
138. Exhibit 59 – Statement of Kylie White, para. 99; annexure KAW-23, p. 195
139. White T1607:24-28; T1639:19-23
140. Written submission of Counsel Assisting, 17 June 2014, Part 5.3, para. 41
141. Third written submission of the Victorian Government, 23 June 2014, para. 123
142. Exhibit 31 – Statement of Robert Kelly, para. 25
143. Neist T1840:15-28
144. Neist T1841:5-8
145. Third written submission of the Victorian Government, 23 June 2014, para.124
146. Exhibit 91 – Expert report of David Cliff, p. 10; Second written submission of the Victorian Government, 18 June 2014, para. 9.4
147. Second written submission of Environment Victoria, 24 June 2014, para. 71
148. Third written submission of the Victorian Government, 23 June 2014, paras 121 & 122
149. Exhibit 59 – Statement of Kylie White, annexure KAW-18, p. 4
150. Neist T1815:23-28; T1817:17-26
151. Written submission of Counsel Assisting, 17 June 2014, Part 5.2, para. 26; Third written submission of the Victorian Government, 23 June 2014, para. 127
152. See for example Exhibit 59 – Statement of Kylie White, para. 190
153. Second written submission of Environment Victoria, 24 June 2014, para. 67
154. Written submission of Counsel Assisting, 17 June 2014, Part 4.1, para. 79
155. Written submission of Counsel Assisting, 17 June 2014, Part 4.1, para. 78
156. Second written submission of Environment Victoria, 24 June 2014, para. 8
157. Neist T1846:10 – T1847:14
158. Second written submission of Environment Victoria, 24 June 2014, para. 7
159. Written submission of Samantha Hepburn, pp. 8-10
160. White T1640:6-24; T1641:3-10
161. Third written submission of the Victorian Government, 23 June 2014, para. 145
162. *Mineral Resources (Sustainable Development) Amendment Act 2014* (Vic), s. 2(3)
163. Written submission of Counsel Assisting, 17 June 2014, Part 4.1, paras 80 & 81
164. Second written submission of Environment Victoria, 24 June 2014, para. 6
165. Third written submission of the Victorian Government, 23 June 2014, paras 144 & 145
166. Written submission of Counsel Assisting, 17 June 2014, Part 4.1, para. 80
167. White T1638:30 – T1639:3
168. Third written submission of the Victorian Government, 23 June 2014, para. 146
169. Exhibit 59 – Statement of Kylie White, paras 53 & 54

3.3 FIRE PREVENTION AND MITIGATION MEASURES TAKEN BY GDF SUEZ

OVERVIEW

This Chapter examines the measures taken by GDF Suez to prevent an outbreak of fire in the Hazelwood mine and to mitigate its spread and severity.

As part of its Terms of Reference, the Board of Inquiry has been asked to inquire into and report on the adequacy and effectiveness of any measures implemented by GDF Suez, including consideration of whether GDF Suez:

- implemented the recommendations arising from reviews of previous events, and
- breached or did not comply with the requirements of (or under) any relevant statute or regulation, including any notification or directive given under such statute or regulation and any code of practice, management plan or similar scheme, developed and/or implemented due to such requirements.

This Chapter explores each of these issues in detail.

The Board heard evidence from employees of GDF Suez about fire prevention measures at the Hazelwood mine. Senior representatives from the Earth Resources Regulation Branch of the Department of State Development, Business and Innovation, and the Victorian WorkCover Authority, as well as Victorian WorkCover Authority workplace inspectors, gave evidence during the public hearings.

The Board received numerous submissions from residents of the Latrobe Valley and from community organisations concerned about the adequacy of fire prevention measures and the progress of rehabilitation at the Hazelwood mine. Some of these community witnesses had formerly worked at the Hazelwood mine and were able to provide useful insights into fire prevention practices historically.

Environment Victoria was given leave to appear at the public hearings and made detailed submissions concerning rehabilitation of the Hazelwood mine and the adequacy of the rehabilitation bond required under the *Mineral Resources (Sustainable Development) Act 1990* (Vic).

The Board of Inquiry engaged Independent expert Professor David Cliff, Professor of Occupational Health and Safety in the Minerals Industry and Director, Minerals Industry Safety and Health Centre, at the University of Queensland. Professor Cliff provided expert evidence on the adequacy of fire prevention measures adopted by GDF Suez, whether measures were in accordance with the requirements of the Victorian regulatory regime, and the response of GDF Suez to prior fire incidents relative to occupational health and safety practices prevalent in the mining industry.

Independent expert, Mr Roderic Incoll, Bushfire Risk Consultant, also assisted the Board. Mr Incoll was previously employed by the State Electricity Commission Victoria in a role that involved providing advice on the external threat of bushfires to brown coal mining operations in the Latrobe Valley. Mr Incoll provided advice to the Board about the adequacy of the fire prevention measures taken by GDF Suez.

The Board considers that GDF Suez did not adequately recognise the risk of a bushfire causing a major fire in the worked out areas of the Hazelwood mine, or the potential impacts such a fire might have on Morwell and surrounding communities. GDF Suez did not conduct a risk assessment in relation to the risk of a fire in the worked out areas of the mine, despite a recommendation to do so following a fire in the worked out areas in September 2008.

Prior to the Hazelwood mine fire, existing fire prevention measures in the worked out areas of the Hazelwood mine were inadequate, with large areas of exposed coal, particularly in the northern batters, not protected by either fixed water sprays or coverage with earth, clay or some other kind of fire retardant. The failure to conduct a proper risk assessment meant that an opportunity to substantially improve fire prevention measures in the worked out areas of the mine, and potentially avoid or reduce the severity of the Hazelwood mine fire, was lost.

There is a range of potential options available to GDF Suez that could significantly reduce the risk of fire in the worked out areas of the Hazelwood mine, each of which has advantages and disadvantages.

In order to determine the most effective and practicable combination of fire prevention measures, the Board recommends that GDF Suez conduct a thorough risk assessment in respect of the worked out areas of the Hazelwood mine. Following this assessment, the fire prevention measures identified should be implemented so far as is reasonably practicable, and GDF Suez's fire management policies revised and updated. Whatever improvements are ultimately adopted, it is clear that doing nothing is not an option if events like the Hazelwood mine fire are to be avoided in the future.

FIRE PREVENTION AND MITIGATION MEASURES ADOPTED AT THE HAZELWOOD MINE

THE HAZELWOOD MINE LICENCE

Coal mining activities in Victoria are regulated under the *Mineral Resources (Sustainable Development) Act 1990* (Vic) (Mineral Resources Act), and related regulations. Under s. 8(1)(a) of the Mineral Resources Act, a person cannot carry out mining in Victoria without obtaining a mining licence. The mine licensing regime is discussed in detail in Chapter 3.2 Regulation of fire risk at the Hazelwood mine.

The Governor in Council approved mining licence number 5004 for the Hazelwood mine on 10 May 1996.[1] On 10 September 1996, the original licence was revoked and the Governor in Council:

- granted a new mining licence number 5004 for a term of 30 years
- approved an authority to commence work
- approved a work plan and a rehabilitation plan.[2]

The mining licence contained a schedule of conditions relevant to environmental matters such as drainage and discharge, groundwater, dust and noise, and operational matters such as roads, fencing, security, car parking and royalties.[3]

The primary obligation under the schedule of conditions to the mining licence is that work at the mine is carried out in accordance with the approved work plan (incorporating a rehabilitation plan), as amended from time to time in accordance with the Mineral Resources Act.[4]

The obligation under the schedule of conditions reflects a licensee's obligations under s. 39 of the Mineral Resources Act to comply with any conditions on the mining licence and the approved work plan, and to work in accordance with the approved work plan.

The following conditions on the licence are also of particular relevance:

15. PROGRESSIVE REHABILITATION

15.1 Progressive reclamation will be conducted as per the rehabilitation plan. In addition, any further rehabilitation work will be carried out at the direction of an Inspector.

15.2 As and when directed by an Inspector of Mines, despite any compensation agreements between the licensee and the owner of any private land in the licence, the licensee shall undertake progressive reclamation of land on the area subject to surface disturbance.

16. FINAL REHABILITATION

16.1 Final reclamation will be in accordance with the rehabilitation plan and any additional requirements as directed by an Inspector.

16.2 Failure to complete works in accordance with the rehabilitation plan or in accordance with the directions of an Inspector, shall constitute grounds upon which the rehabilitation bond may be forfeited either in whole or in part in accordance with Section 83 of the MRD Act [Mineral Resources Act].[5]

On 11 July 2006, mining licence number 5004 was amalgamated with mining licences 5449–5452 and varied to permit mining to take place on the west field of the Hazelwood mine, and to require the licensee to spend $667,930 per annum on mining work in the licensed area.[6]

APPROVED WORK PLAN FOR THE HAZELWOOD MINE

WORK PLAN – 1996

The work plan for the Hazelwood mine approved on 10 September 1996 has since been varied seven times, with the latest and most substantial variation being approved in 2009.[7]

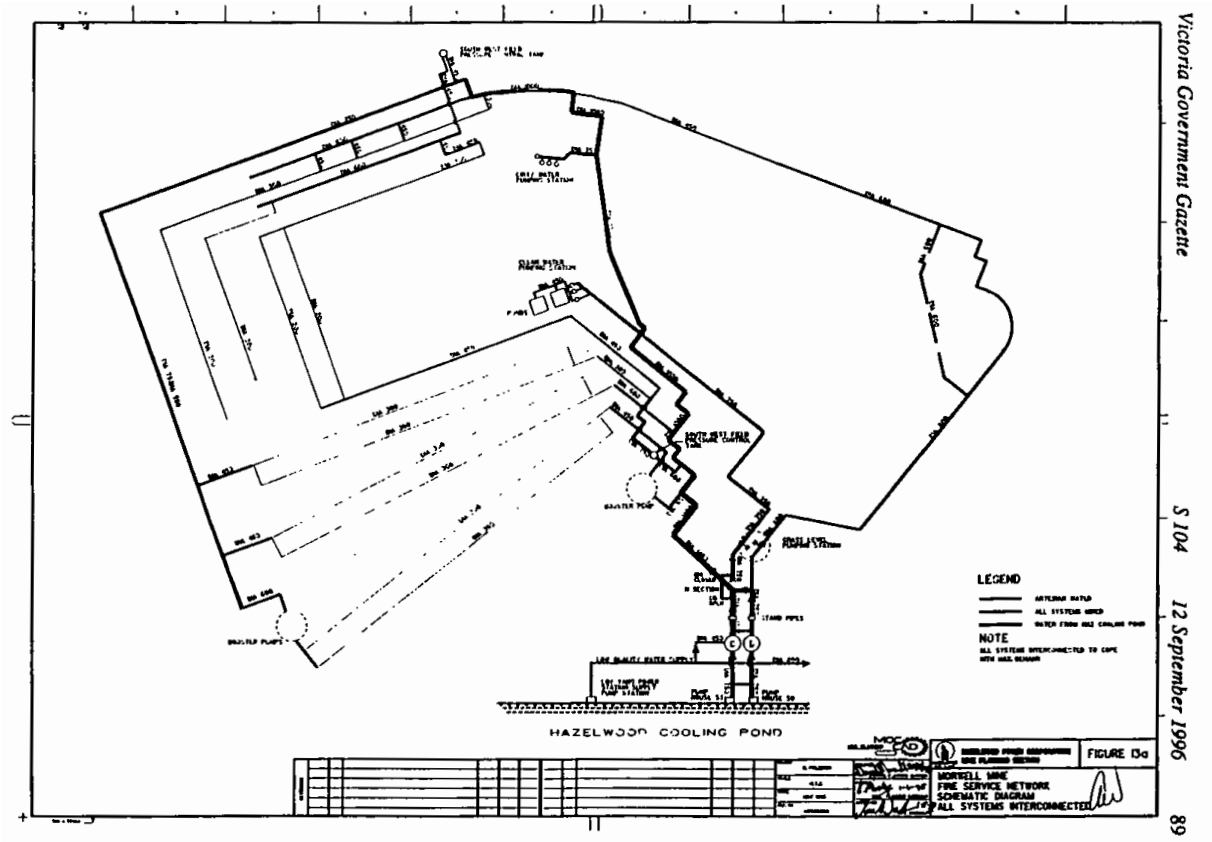
The 1996 work plan reflected the 'Work Plan Submission' submitted by Hazelwood Power Corporation on 1 June 1995.[8]

The following clauses of that work plan submission address the risk of fire at the Hazelwood mine:

> 7.4 Bushfire Mitigation Program
>
> In recognition of the fact that the Mine is situated in high bushfire risk area and the potential consequences on the Mine infrastructure of a bushfire, [Hazelwood Power Corporation] contributes to funding a Bushfire Mitigation Program in the area surrounding the mine. The Bushfire Mitigation Program conforms with the "Latrobe Valley Open Cut Mines – Fire Service Policy and Code of Practice" – see Section 7.7 below.
>
> 7.5 Emergency Response Plan
>
> [Hazelwood Power Corporation] has developed an Emergency Response Plan to be followed in the event of an emergency such as fire or flood, catastrophic failure of Mine or plant, bomb threats, hazardous materials etc.
>
> 7.6 Fire Instructions
>
> As part of Fire Prevention management [Hazelwood Power Corporation] has promulgated a set of Fire Instructions for Mine personnel, these instructions are updated prior to every fire season – usually in December. Prior to the fire season each year all Mine personnel are required to undertake fire training conducted by the Mine's fire service section. The Fire Instructions are incorporated as part of the Mine's Emergency Control Plan.
>
> 7.7 Fire Protection Policy
>
> [Hazelwood Power Corporation] adheres to the "Latrobe Valley Open Cut Mines – Fire Service Policy and Code of Practice" issued April 1994 for the Mine, bunkers and their surroundings to ensure adequate:
>
> - Management Accountability
> - Preparedness and Planning
> - Training of Personnel
> - Installed Fire Protection Systems
> - Fire Extinguishing Capability
> - Emergency Procedures.
>
> The Fire Service Policy and Code of Practice contains the essential requirements and operating procedures for fire protection services for the Mine and its surrounding area.
>
> An extensive network of water reticulation and sprays has been established in the Mine for fire protection.
>
> Refer Figure 13A: "Fire Service Network Schematic"[9]

The Mine Fire Service Policy and Code of Practice is discussed in further detail below. Figure 13A to the 1996 work plan is depicted in Figure 3.5 below.

Figure 3.5 Fire service network schematic for the Hazelwood mine – Figure 13A to 1996 work plan[10]



WORK PLAN VARIATION – 2009

On 8 February 2008, GDF Suez applied to vary the work plan in order to allow the expansion of mining in the west field of the Hazelwood mine.[11] A delegate of the Department Head of the Mining Regulator approved the work plan variation on 11 May 2009.[12]

The objective of the west field development was to ensure an uninterrupted supply of coal to the Hazelwood Power Station beyond 2009. It involved two phases:

- Phase 1 involved mining areas of the west field known as block 1A and 1B, which fell within the existing licence boundaries and had already commenced in February 2004.
- Phase 2 involved an expansion beyond the initial boundaries of mining licence number 5004 into areas designated block 1C, 2A, 2B, 3 and 4. Four new mining licences were issued to expand the mine licence boundaries (which were subsequently amalgamated into mining licence number 5004, as noted above).[13]

The work plan variation was required in order to expand into phase 2 of the west field development.[14]

The mine blocks for phase 1 and phase 2 of the west field development are depicted in Figure 3.6 below.

Figure 3.6 West field development at the Hazelwood mine[15]

The 2009 work plan variation provides that mining of overburden and coal as part of the phase 2 west field development will be carried out according to the schedule in Figure 3.7 below.

Figure 3.7 Mining schedule for phase two of west field development[16]

Block	Overburden	Coal
1C	2010 to 2015	2011 to 2019
2A	2016 to 2017	2018 to 2021
2B	2018 to 2025	2019 to 2028
3	2026 to 2028	2027 to 2031
4	2028	2027 to 2031

Mr James Faithful, GDF Suez Technical Services Manager–Mine, explained to the Board that 'references to "overburden mining" [in the work plan] refer to the removal of the soil/clay material overlying the coal… [and] "coal mining" means the mining operations in relation to the on average 100 metre thick coal seam underlying the overburden.'[17] Mr Faithful also confirmed that block 1C is still being mined.[18]

The work plan proposes that the fire management for the west field development 'will be a continuation of existing methods, and generally comply with the Latrobe Valley Open Cut Fire Protection Policy.'[19]

As noted in Chapter 3.2 Regulation of fire risk at the Hazelwood mine, at the time that the 2009 work plan variation was prepared, work plans were required to include a health and safety management plan.[20] Section 9.1 of the 2009 work plan variation states that GDF Suez:

- is compliant with Australian and New Zealand Standard 4801:2001 'Occupational health and safety management systems –Specification with guidance for use' (AS4801)
- has developed a range of policies, which relevantly includes the 'Mine Fire Service Policy and Code of Practice.'[21]

The health and safety management plan also refers to a risk assessment undertaken by GDF Suez in 2003 to identify major occupational, health and safety mining hazards associated with the development of the west field.[22] This risk assessment was conducted in order to fulfil the work plan criteria required under the Mineral Resources Development Regulations 2002 and the obligation to conduct a safety assessment of major mining hazards under the Occupational Health and Safety (Mines) Regulations 2002 (as it then was).[23] As part of the risk assessment, 'major mine plant fire' is identified as a potential major mining hazard.

The 2003 risk assessment/safety assessment is explored in further detail under the heading 'Safety assessment' below.

APPROVED REHABILITATION PLAN FOR THE HAZELWOOD MINE

REHABILITATION PLAN – 1996

The 1996 work plan includes a rehabilitation plan that addresses both final rehabilitation and progressive rehabilitation. Hazelwood Power Corporation's 1995 work plan submission (which forms part of the 1996 work plan) described the goal of rehabilitation as follows:

> Hazelwood Power Corporation has made a strong commitment to rehabilitate land disturbed by mining operations in accordance with community expectations.
>
> The Mine has a long standing policy to ensure that all land disturbed by mining is stabilised and landscaped to blend into or complement natural features. This policy was developed in consultation with government agencies, special interest groups and the public, chiefly through the Rehabilitation Consultative Group, which meets quarterly.[24]

Final rehabilitation of the mine was reflected in a 'Rehabilitation Concept Master Plan', which envisaged that ultimately the worked out part of the Hazelwood mine would be flooded to form a lake and the surrounding areas could be used for grazing, conservation, active and passive recreation, wetlands habitat and forestry.[25] In 1996, only preliminary studies into the creation of a lake had been carried out.[26]

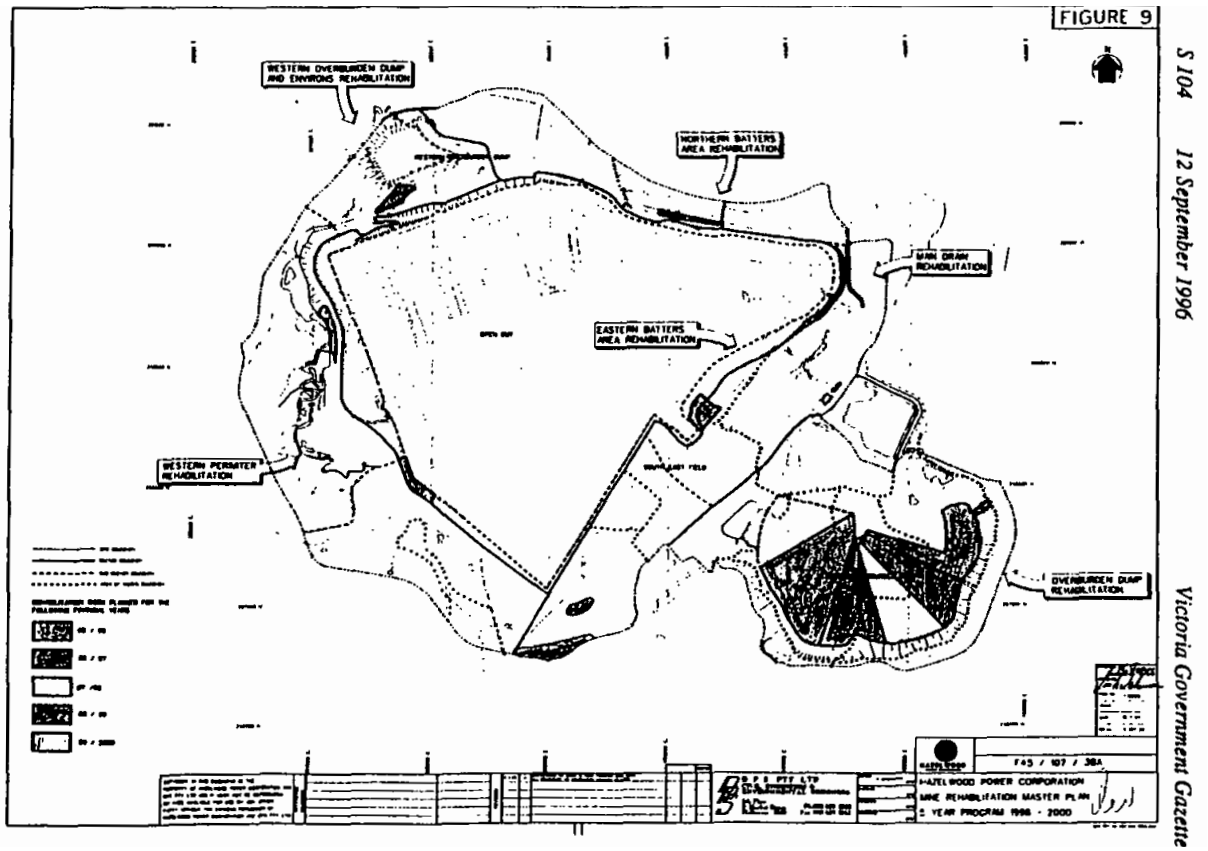
The Rehabilitation Concept Master Plan contains a 'Mine Rehabilitation Policy', which provides directives for three phases of mine operation as follows:

> (i) Operational Phase
>
> Where physically practical, screen operational work areas to minimise visual intrusion and minimise disturbance to waterways, vegetation and landforms in nonoperational areas.
>
> (ii) Post Operational Phase
>
> During the life of the project, progressively, and at the earliest practical opportunity after land is no longer required for operations – shape, landscape, revegetate and return disturbed land to its pre-mined capability for agricultural and silvicultural uses in order to:
>
> - stabilise slopes
> - manage water runoff to control erosion
> - provide a sustainable landform and vegetation pattern that blends into or complements the existing natural features of the region
> - provide ultimately for other sustainable beneficial uses
> - comply with the Rehabilitation Master Plan.
>
> (iii) Mine Closure Phase
>
> With mine closure imminent, consolidate activities of the post operational phase and liaise with agencies and the public to ensure that:
>
> - sustainable beneficial land uses have been achieved
> - rehabilitated land is safe to return to public or private holding.[27]

In terms of progressive rehabilitation at the Hazelwood mine, a '5 year Rolling Implementation Plan' was prepared with the aim of scheduling ongoing rehabilitation to a five year projection and revising the plan annually or as required.[28]

The initial five year Rolling Implementation Plan for the period 1996 to 2000, depicted in Figure 3.8 below, envisaged that several sections of the worked out areas of the Hazelwood mine (including small sections of the northern and eastern batters indicated with shading in Figure 3.8) would be the subject of rehabilitation works. No evidence was provided to the Board to explain the extent to which rehabilitation was carried out in accordance with this early plan.

Figure 3.8 Rehabilitation Master Plan—Five Year Program 1996–2000[29]



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REHABILITATION PLAN VARIATION – 2009

Section 6 of the 2009 work plan also addresses rehabilitation. The goal for rehabilitation of the mine is described as 'a technically feasible, safe, stable and sustainable landscape that reflects the aspirations of stakeholders within the practical constraints of rehabilitation for the mine.'[30] This goal required the following objectives to be met:

- a safe and stable self-supporting structure
- maximise the opportunities for establishment of a self-sustaining ecosystem
- minimise the use of natural resources
- minimise the cost of recovery of resources.[31]

The 2009 work plan identified several issues for consideration in developing and implementing the rehabilitation plan:

- mine stability
- natural equilibrium
- batter stability
- infrastructure
- rehabilitation material/ecosystem function
- resource recovery
- public safety.[32]

Section 6.5 of the 2009 work plan deals with progressive rehabilitation at the Hazelwood mine. Importantly, this section acknowledges the role that progressive rehabilitation can play in fire prevention:

> There are 2 major tasks to be completed using overburden:
>
> 1. coverage of coal batters to provide fire protection and a nutrient base to support plant growth that in turn provide long term batter stability
> 2. placement of the balance of overburden material on the floor of the mine to assist with counterbalancing aquifer pressures.[33]

Ms Kylie White, Executive Director of the Earth Resources Regulation Branch of the Department of State Development, Business and Innovation,[34] confirmed that it is 'still the requirement that during the life of the mine progressive rehabilitation occur at the earliest practical opportunity after the land is no longer required for operations,'[35] reflecting the post-operative rehabilitation requirements of the Mine Rehabilitation Policy described in the 1996 work plan.

Mr Faithful provided the Board with evidence regarding the steps required as part of rehabilitation. As a preliminary matter, worked out batters must be 'reshaped' as part of rehabilitation, that is, laid back and re-profiled, in order to:

- ensure the stability of soil placed on the batters
- enable revegetation
- make the area visually compatible with surrounding land
- make the areas capable of being used by the public and for other purposes post closure.[36]

He explained that worked out batters at the Hazelwood mine are typically at a slope of about 1H:1V (ie one metre horizontal for every one metre vertical) and must be progressively laid back to a slope of no steeper than 2.5H:1V and preferably 3H:1V.[37]

According to Mr Faithful, the steps involved in rehabilitation are:

- Stability assessments: Stability assessments take the current known stability of the batters and then model the stability level after the proposed rehabilitation is completed. A range of variables, including batter profiles, groundwater levels, seismic events, and weather events are simulated to determine how the rehabilitated batters would perform under varying load conditions. Once that assessment is undertaken, controls such as horizontal bores, open drains and vertical pumping bores are then simulated to ensure that the resulting batter safety factors are not compromised.
- Planning: Based on the desired batter profile (or 'steepness'), the extent to which the existing batters need to be laid back has to be determined.
- Identification and removal or relocation of mining infrastructure: Depending on what the infrastructure is, and what stage of the mining sequence has been reached, infrastructure that is required for the ongoing operation of the mine may need to be rebuilt in a different location.
- Removal of coal and overburden and reshaping: This work is completed using a method called "truck and shovel". Excavators (shovels) are used to progressively remove the coal and the overburden from each of the levels and this material is carted away in trucks. This is the most complex process.
- Covering with overburden: The layer of overburden is typically about one metre deep.
- Revegetation: After the batters are reshaped, and covered in suitable overburden, topsoil is spread on the area and the area is revegetated. Any necessary geotechnical equipment (eg horizontal bores, standpipes, inclinometers, extensometers) is installed.[38]

Mr Faithful also identified a number of practical constraints faced by GDF Suez in planning areas for progressive rehabilitation:

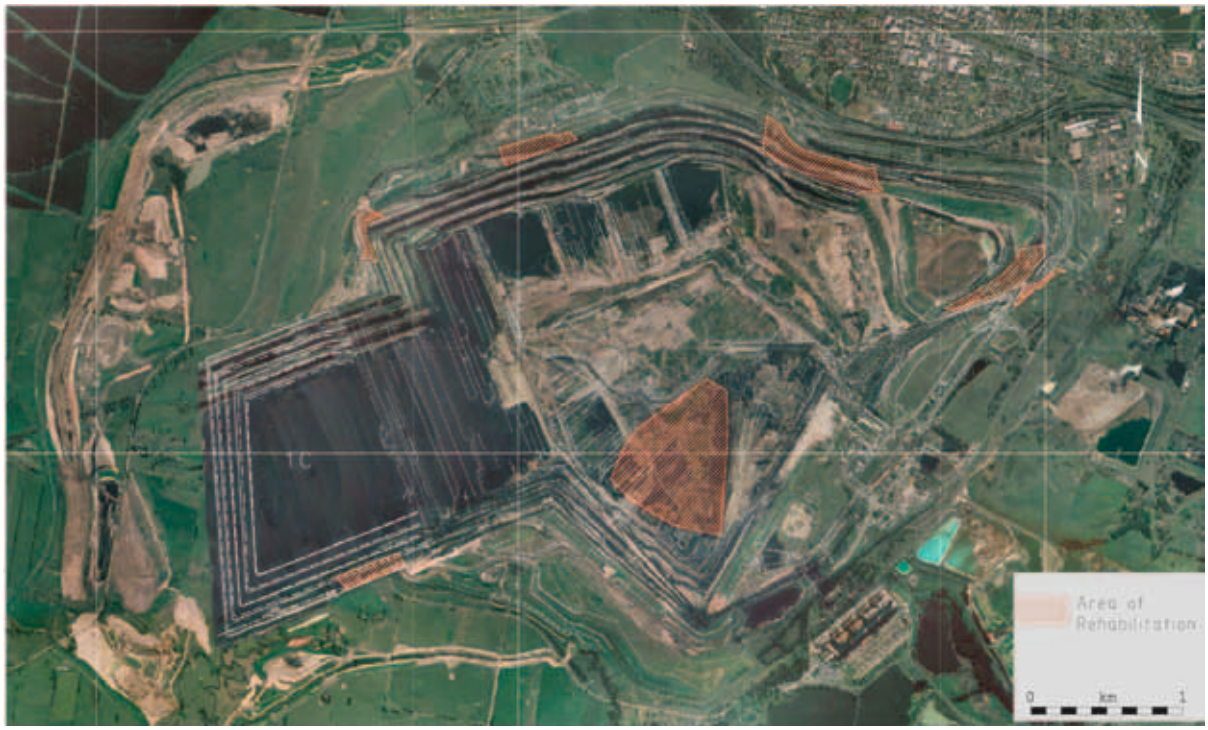
- Availability of sufficient quantities of suitable overburden: The composition of the overburden (dirt and clay overlaying the coal, utilised in rehabilitation works) varies throughout the Hazelwood mine. Overburden is not always suitable for placement on batters. Further, only a certain volume of overburden is available from recent mining operations conducted within the mine. Additional suitable overburden material may have to be located.
- Construction constraints: Typically, given the ground conditions at the mine, "earthworks" projects such as rehabilitating batters can only be carried out between November and April due to difficulties with the wet weather outside of this period. In the Latrobe Valley, the earthworks season is generally limited to the period from Melbourne Cup Day to Anzac Day.
- Infrastructure positioned on the northern batters: Important infrastructure is situated on the northern batters, which would need to be removed in order for the rehabilitation works to be completed. Such infrastructure includes power lines, fire services mains pipes, pumps, ponds and groynes, roads, ramps and benches, bores, other geotechnical equipment and roadside/ underground drains.
- Infrastructure positioned north of the northern batters: In order to reduce the grade of the batter and allow for future land use, an area of land at the top of the batter would need to be removed. Mine infrastructure and other infrastructure (ie SP Ausnet's high voltage power lines which service Morwell and other towns, the Princes Freeway and the Morwell Main Drain) are likely to be affected by such works and would need to be assessed and managed (including with third parties).
- Future mining direction: Mining will eventually proceed further to the north at the western end of the Hazelwood mine. The batters at the western end of the northern batters are temporary batters, which will be directly mined through. Any overburden placed over the top of these batters as part of rehabilitation works would need to be later removed.[39]

The 2009 work plan recognises the requirement for suitable overburden material as a potential obstacle to progressive rehabilitation. Overburden from blocks 1A, 1B and 1C comprise significant volumes of fine grained sands from the former Morwell River valley, which are saturated and are only suitable for batter coverage if given sufficient time for the water content to dissipate. The proposed mine sequencing would not allow sufficient time for dissipation of the water content to occur, so the overburden from these blocks was only deemed suitable for placement on the mine floor.[40]

Under the 2009 work plan, the planned sequencing of progressive rehabilitation is directly linked to the nature of the overburden as it becomes available from mining operations.[41]

The first area designated for rehabilitation at the end of mining block 1C is shaded in red in Figure 3.9 below. The area at the eastern end of the northern batters corresponds with an area that was significantly affected by the Hazelwood mine fire.[42]

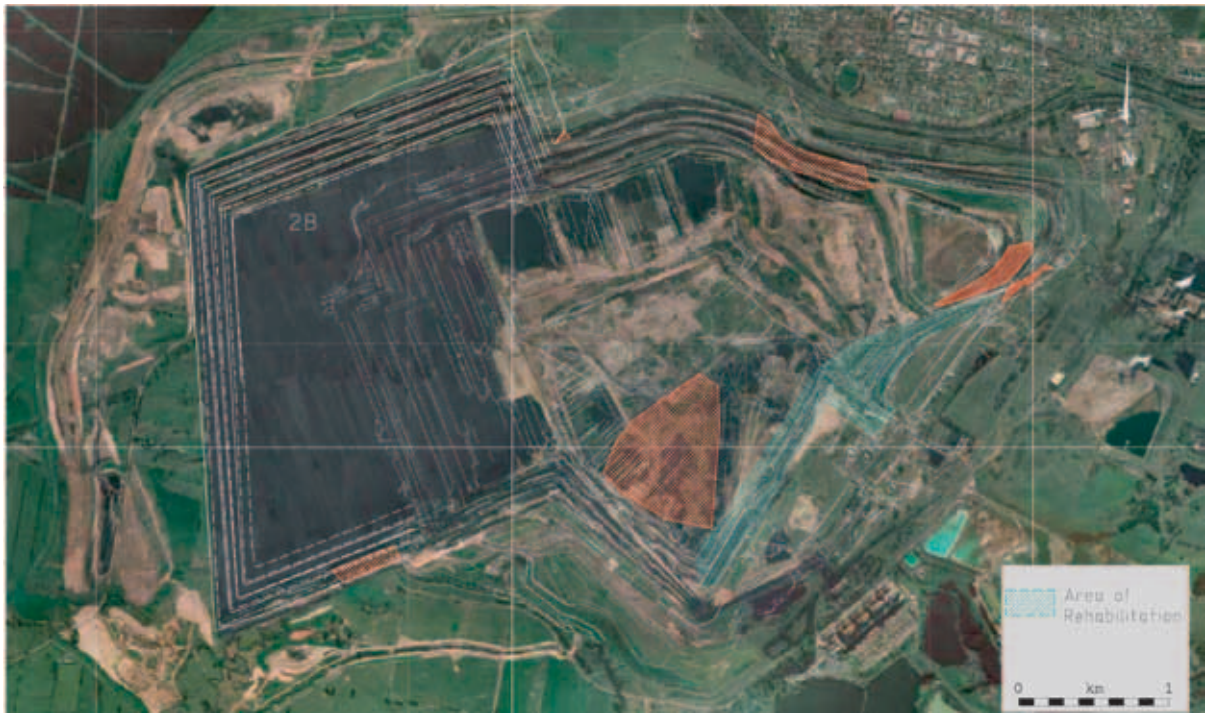
Figure 3.9 Progressive rehabilitation staging/sequencing – rehabilitation at end of block 1C (2019)[43]



Suitable overburden material for the first stage of progressive rehabilitation will only become available once overburden mining operations move into block 2A, currently scheduled for 2016–2017 and block 2B, scheduled for 2018.[44]

Overburden materials from block 2B mining operations are inherently more stable and have been scheduled for use in rehabilitation works on the eastern and southern batters at the conclusion of operations in block 2B in 2028 (Figure 3.10).[45]

Figure 3.10 Progressive rehabilitation staging/sequencing – rehabilitation at end of block 2B (2028)[46]



The final stages of rehabilitation are planned to take place at the end of mining block 3 and 4 in 2031 (Figures 3.11 and 3.12).

Figure 3.11 Progressive rehabilitation staging/sequencing – rehabilitation at end of block 3 (2031)[47]

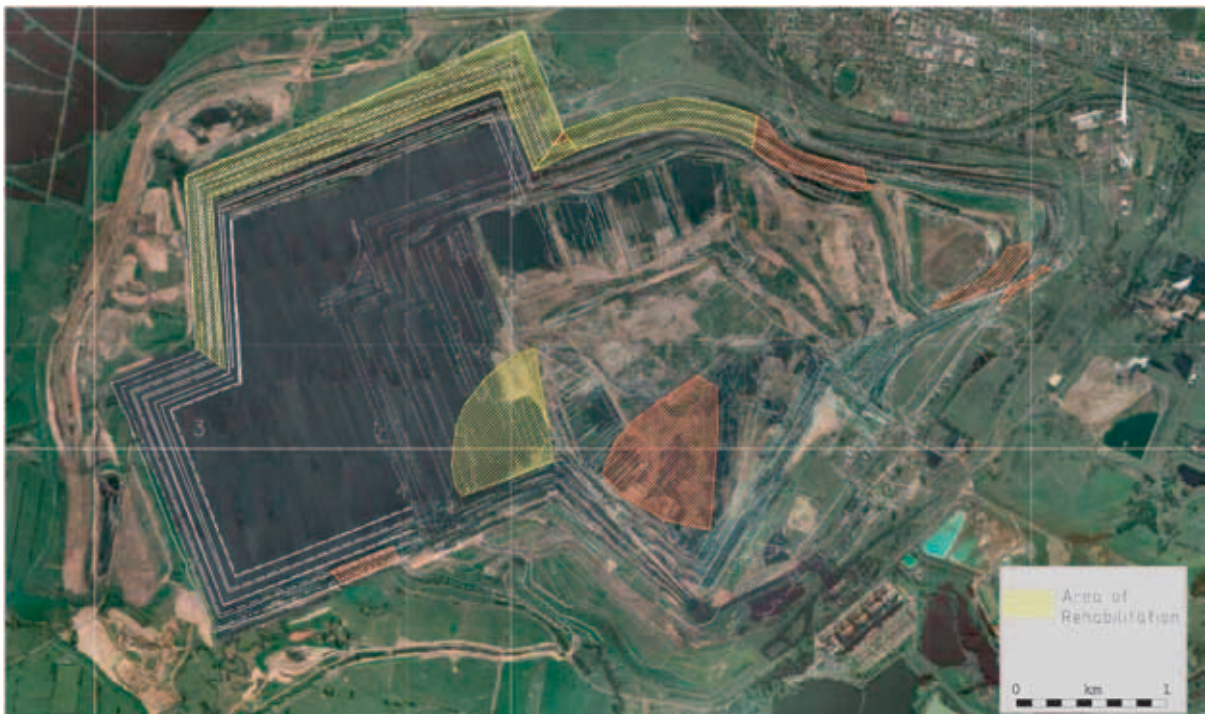
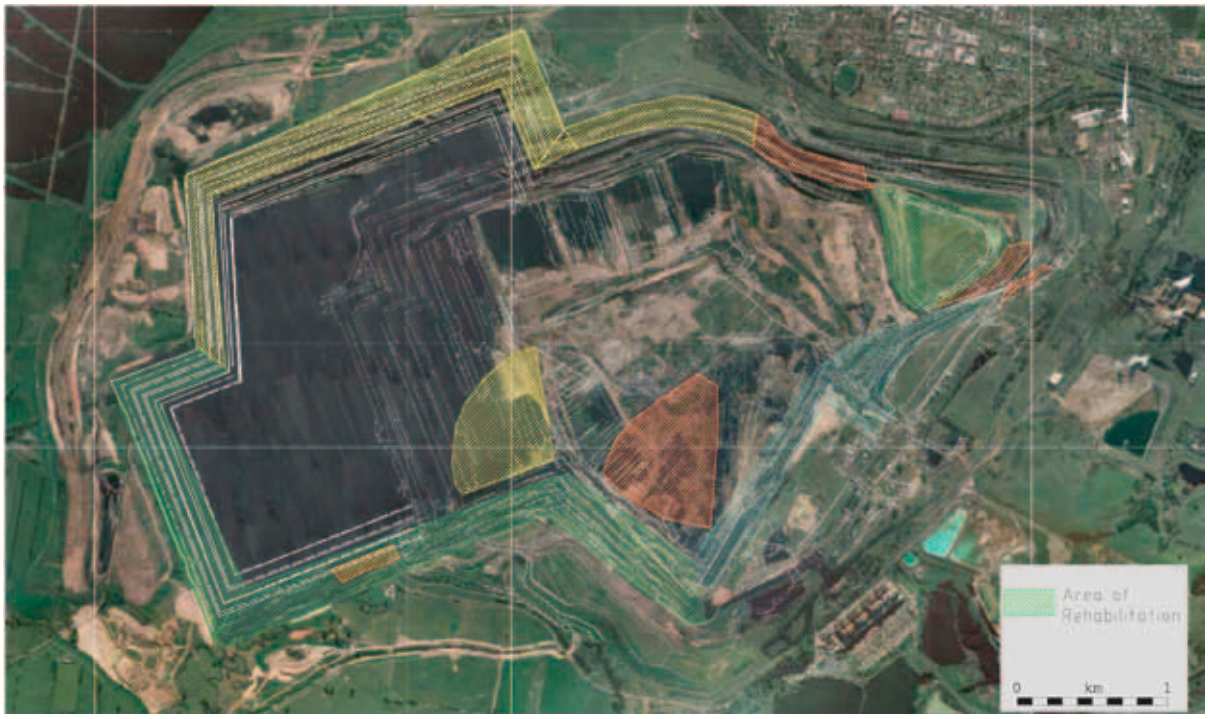


Figure 3.12 Progressive rehabilitation staging/sequencing – rehabilitation at end of block 4 (2031)[48]



Prior to GDF Suez formally applying to vary the work plan, the proposed expansion at the Hazelwood mine also involved the preparation and assessment of an Environment Effects Statement (EES) amendment to the Latrobe Planning Scheme and four planning permits.[49]

The panel commissioned to assess the EES and the Latrobe Planning Scheme amendment conducted hearings in 2004 and 2005, in which rehabilitation issues formed a key component.[50] The panel found that:

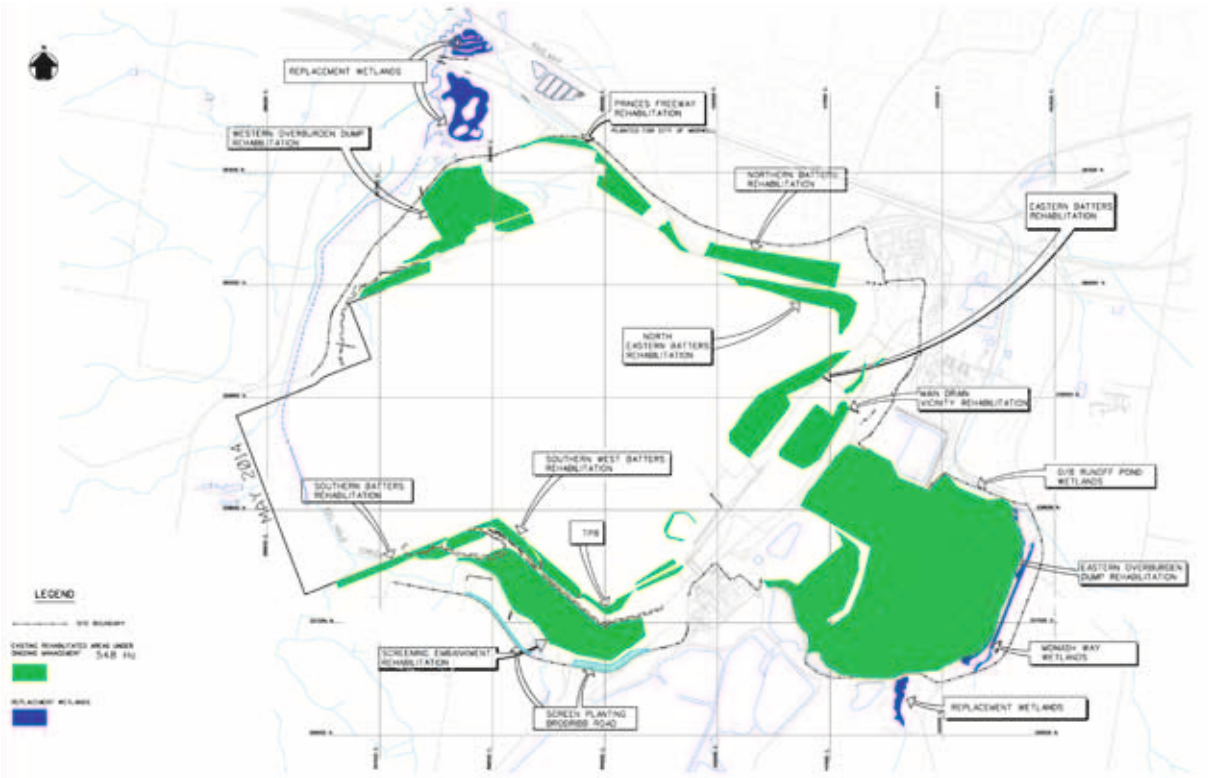
> The potential for long-term degradation of the environment will depend on the actions taken as part of the rehabilitation process. For example, instability of the mine could impact on the local surface and subsurface drainage systems. The mine could also be a source of dust unless the revegetation is successful. Unless the risk of fire from the ignition and subsequent slow combustion of coal remaining within the mine void are minimised, smoke could be a significant nuisance. An extreme possibility of an off-site effect is the escape of a fire in the mine area into surrounding land.[51]

PROGRESS OF REHABILITATION UNDERTAKEN AT THE HAZELWOOD MINE

From the inception of the Hazelwood mine to the end of June 2013, approximately 609 hectares of land (including worked out areas, overburden dumps and mine perimeter areas) had been rehabilitated, of which approximately 90 hectares was subsequently lost to the west field expansion.[52]

The areas of the Hazelwood mine that have been rehabilitated to date are illustrated in green in Figure 3.13.

Figure 3.13 Progressive rehabilitation at the Hazelwood mine as at May 2014[53]



Since privatisation of the mine in 1996/1997, 431.3 hectares of the mine have been rehabilitated, however Mr Faithful informed the Board that this figure does not paint the full picture.[54]

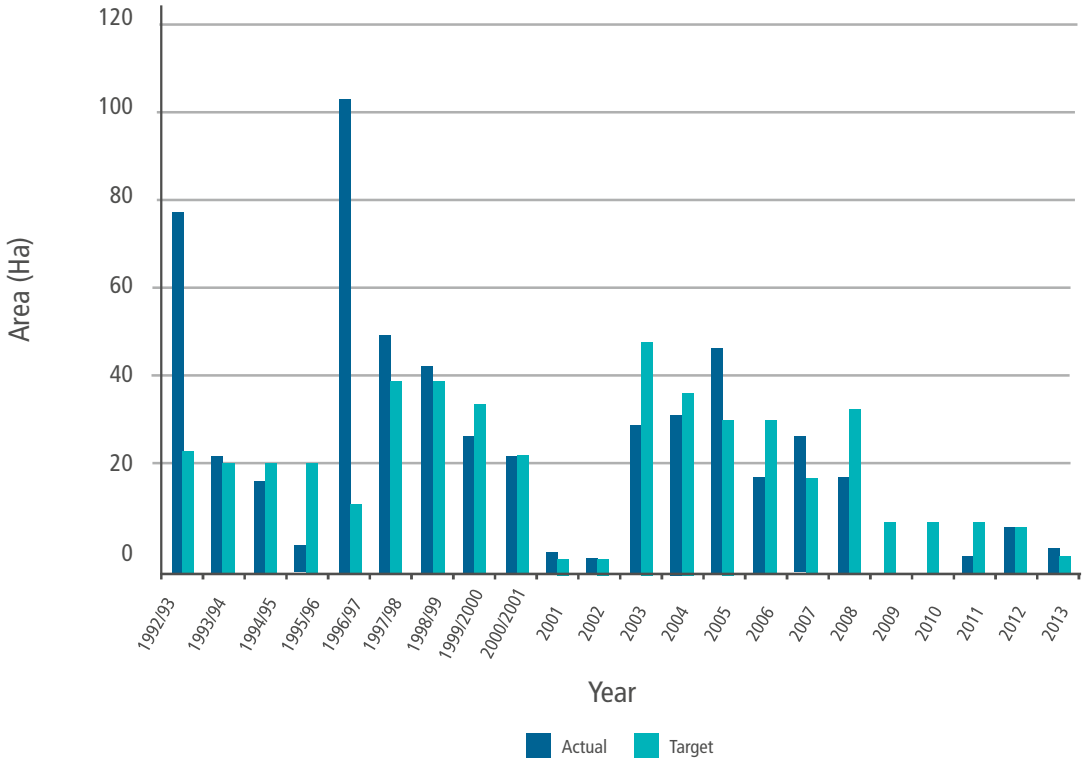
According to Mr Faithful, the majority of the rehabilitation works carried out at the mine prior to privatisation were 'easy wins', for example, external waste dumps, where all that was required was grading the overburden material (which was already relatively flat), and topsoiling and revegetating the area.[55] Prior to privatisation, no rehabilitation works were undertaken within the pit or on any of the worked out areas of the Hazelwood mine.[56]

This was confirmed by Mr Robert Gaulton, former Mine Geologist with the SECV who worked at each of the Latrobe Valley mines between 1972 and 1996, and by Mr Graeme Freshwater, the former Mine Manager at the Hazelwood mine employed by the SECV.[57]

Some of the more recent rehabilitation projects undertaken by GDF Suez have been more difficult and labour and time intensive, as they have involved worked out areas and have therefore required re-profiling of batters and the removal of infrastructure. For example, between 2008 and 2012, the eastern end of the northern batters (being the part of the Hazelwood mine closest to the Morwell township) was rehabilitated.[58] Significantly, the Hazelwood mine fire in 2014 did not impact this area.

Figure 3.14 illustrates the extent of rehabilitation undertaken at the Hazelwood mine against its progressive rehabilitation targets under the work plan in effect from time to time.

Figure 3.14 Progressive rehabilitation against work plan targets from 1992–2013[59]



There was a difference in interpretation between GDF Suez and the Mining Regulator regarding whether the progressive rehabilitation proposed in the 2009 work plan needed to be commenced or completed by the end of mining each relevant block.[60] For example, in the case of block 1C, GDF Suez understood that progressive rehabilitation had to be commenced by the end of that mining sequence in 2019, whereas the Mining Regulator's view was that the planned progressive rehabilitation had to be completed by that date. This is a matter that both parties are willing to discuss.[61]

As outlined above, a number of preparatory steps, such as stability assessments and removal of infrastructure need to be carried out before overburden can be utilised. The whole process might take 4–5 years and accordingly, in order to complete the first planned stage of rehabilitation by 2019, stability assessments will need to commence very shortly.[62]

Although preparatory work for the end of the block 1C rehabilitation project has not yet commenced,[63] GDF Suez is still identifying and carrying out smaller rehabilitation projects, with approximately 20 hectares rehabilitated since the 2009 work plan was approved.[64] Shortly prior to the Hazelwood mine fire, a further nine hectares in the northern and eastern batters of the mine had been identified as potentially suitable for rehabilitation works in 2014. This area will be rehabilitated at the end of 2014.[65]

ADEQUACY OF REHABILITATION BOND

The Board received several submissions querying the adequacy of the rehabilitation bond for the Hazelwood mine required under s. 80 of the Mineral Resources Act.[66]

The licensee paid a rehabilitation bond of $15 million by way of bank guarantee in May 1996, and this amount was reaffirmed on 8 June 2001.[67] No witness was able to explain to the Board the precise methodology applied to determine the amount of the bond in 1996.[68] It appears from pre-privatisation documents located by the Mining Regulator that the rehabilitation bond was set at $15 million as an 'interim figure' based on 'an estimate of rehabilitation costs for ongoing progressive rehabilitation and final rehabilitation at present day values.'[69] As at December 1995, the total rehabilitation liability was estimated to be around $20 million.[70]

Environment Victoria submitted that $15 million was demonstrably inadequate to cover the costs of rehabilitation of the Hazelwood mine.[71] According to Mr George Graham, GDF Suez Asset Manager, the costs to complete rehabilitation would be less than $100 million, or about '$80-something million'.[72] Ms White agreed that $15 million appeared to be an underestimate, particularly in light of the expansion of the Hazelwood mine, and that it was time for a reassessment.[73]

Section 79A of the Mineral Resources Act allows the amount of a rehabilitation bond to be reassessed. In 2010, the Mining Regulator commenced a project to devise a methodology to assess the rehabilitation liability for all mines in Victoria, but this stalled and was only recently re-enlivened.[74] The Victorian Government suggested that this project might result in the rehabilitation bond for the Hazelwood mine being increased.[75]

Significantly, the amount of the bond was not re-assessed in 2001 or in 2009 when the land subject to the mining licence was substantially increased with the result that more land would be disturbed and require rehabilitation.[76]

Whilst there is considerable disparity between the current rehabilitation bond and the likely future rehabilitation liability, there are a number of other considerations raised by the parties that might influence the assessment of the bond amount. These include how future costs are tied to the approved progressive rehabilitation plan,[77] the overall 'risk profile' of the licensee[78] and its record of compliance, and the need to provide an incentive for the licensee to meet its rehabilitation obligations.[79] Examination of the most appropriate balance between these competing factors goes well beyond the Board's Terms of Reference but may be considered as part of the Mining Regulator's review of its methodology for setting rehabilitation bonds.

FIRE MANAGEMENT POLICIES AND PROCEDURES

GDF Suez maintains a number of fire management policies and procedures, including the following:

- Emergency Response Plan – Hazelwood Mine (revised May 2013)
- Mine Fire Service Policy and Code of Practice (revised July 2013)
- Hazelwood Mine Fire Instructions (issued 27 July 2011)
- Internal Grass Slashing – Specification for Grass Mowing (issued 17 October 2011)
- Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning (issued 13 September 2007)
- Check List for Fire Fighting Equipment Annual Inspection (issued 18 January 2013)
- Check List for Season Specific Fire Preparedness and Mitigation Planning (issued 24 November 2008)
- Check List for Hazelwood Slot Bunker Fire Services Wash Down and Routine Inspection (issued 18 January 2013)
- Mine Fireman Assessment (issued 24 February 2012)
- Fire Person Duties Training Manual (issued 23 August 2012)
- GDF Suez Hazelwood Electricity Safety - Bushfire Mitigation Plan (for the period commencing 1 July 2013).[80]

The Mine Fire Service Policy and Code of Practice is the central document concerning fire management strategies at the Hazelwood mine and is referred to in the work plan. This document is explored in further detail below under the heading 'Mine Fire Service Policy and Code of Practice (revised July 2013)'.

While the 'Hazelwood Mine Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning' primarily address preparedness to respond to the outbreak of fire, they also refer to a number of matters that are relevant to the issue of fire prevention.[81] The Guidelines note that 'wetting down exposed coal levels will assist in dust suppression.' This is important because:

> With the right conditions brown coal, once loosed and mixed with air, will readily spontaneously combust, while brown coal still undug is in the safest fire resistance condition. While the local conditions within the Morwell brown coal mine may and will often be very different to that of the surrounding areas, the mine conditions will usually be more severe than the surrounding areas; this is due to the lack of grassland, promoting rapid run off of rainfall, and the depth of the mine promoting its our [sic] unique environment. Consequently, the brown coal levels will usually dry out quicker than the surrounding grassland fields, promoting a problem with air borne coal dust, and the greater need for dust suppression.[82]

The Guidelines also recognise the risk of flying embers entering the mine:

> 6.7 FLYING EMBERS
>
> Flying embers from wildfire in remote grasslands and forests can travel for kilometres and contain sufficient energy to start spot fires when they land on combustible materials. During times when bushfires are in the immediate area, a heightened awareness is required to detect the landing of these fire initiation sources and hence to take immediate action to report and put these spot fires out.[83]

Other policies and procedures relating to preparedness to respond to fire are discussed in Chapter 2.2 Preparing for fire.

Mr Steven Harkins, GDF Suez Director of People, Culture and Environment, explained that each year GDF Suez declares the commencement of a fire season, sometimes as early as November, depending on how wet or dry the winter period has been.[84]

In the lead up to the commencement, or during the early stages of the declared fire season, a range of preparedness measures are undertaken at the Hazelwood mine, including grass slashing and other fuel reduction measures.[85]

Mr Robert Dugan, GDF Suez Mine Production Manager, stated that each year GDF Suez conducts a grass slashing program, comprising approximately 530 hectares between the mine boundary and the top of the open cut, which is usually completed by December or January.[86] Mr Dugan explained that he conducts a review in about February of each year to determine whether the grasslands require any further slashing.[87]

GDF Suez has documented the requirement to conduct grass slashing in the Mine Fire Service Policy and Code of Practice. Section 7.9 specifies that by the beginning of the declared fire season, an up-to-date drawing of the 'Fire Prevention, Slashing, Grazing Layout Plan' should be issued. Grass cutting must then be carried out in accordance with the Plan, with the actual start and finish dates for grass cutting dependent on weather conditions.[88]

The GDF Suez 'Internal Grass Slashing – Specification for Grass Mowing' procedure prescribes the equipment and method to be used when undertaking grass slashing works.

GDF Suez produced a 'scope of works' document for grass slashing to be carried out for the 2013/2014 fire season.[89] Under the scope of works, slashing, mulching and mowing were to be carried out in two stages:

- Stage 1: initial slash from November to December 2013, to be completed by 31 December 2013.
- Stage 2: follow up slash of regrowth if required, to be completed by mid-February 2014.[90]

Upon completion, all grass, weeds and undergrowth were required to be no greater than 75 millimetres in height.[91]

According to the Slashing, Mulch & Mowing Layout Plan, these works covered areas outside of the perimeter of the open cut, and not the mine floor or batters.[92]

In the 2013/2014 fire season, grass slashing was completed by the first week of January 2014.[93] On around 3 February 2014, Mr Dugan prepared a weekly status report on preparedness measures at the Hazelwood mine, which noted that grass slashing was complete, but follow up slashing might be required in late February 2014.[94]

During the Hazelwood mine fire, Mr Kevin Hayes, Field Subject Matter Expert and Workplace Inspector, Earth Resources Unit at VWA, visited the Hazelwood mine on a number of occasions.[95] Toward the end of the mine fire, on 20 March 2014, Mr Hayes observed that grass in excess of 100 millimetres in height and trees and shrubs had been allowed to grow within the 50 metre fire break zone around the perimeter of the mine. Mr Hayes issued an improvement notice to GDF Suez under the *Occupational Health and Safety Act 2004* (Vic) (OHS Act), which required GDF Suez, by 23 June 2014, to maintain the fire break corridor, to review the adequacy of the 50 metre wide fire break, and to review the requirement to regularly monitor its maintenance particularly during the fire season.[96]

Throughout the declared fire season, GDF Suez adopts a range of other measures to reduce the risk of fire at the Hazelwood mine, including:

- the issuing of fire preparedness plans and alerts on high risk days
- wetting down of coal faces in the operating areas of the mine
- washing down vehicles entering the mine
- having water tankers available and kept at least half full.[97]

The practice of wetting down coal faces is documented in the Hazelwood Mine Fire Instructions issued 27 July 2011.[98] This policy document primarily deals with preparedness and response measures in the event of a fire and is discussed in more detail in Chapter 2.2 Preparing for fire.

The Instructions also refer to some procedures aimed at the prevention of fire. Under the Instructions, the Director of Mining, the Production Manager, or the Mine Production Superintendent declares a 'Fire Alert' when hot, dry or windy conditions are expected and there is a high risk of fire rapidly spreading in the mine.[99] When a 'Fire Alert' has been declared:

> [A] Shift Operations staff member shall continuously man the Control Centre Office. The 1x7 [crew] shall ensure that cable protection sprays are turned on for initial wetting down and that wetting down is carried out on coal surfaces, conveyors and transfer points to provide Fire protection and to check the spread of any Fire.[100]

This practice is limited to operational parts of the Hazelwood mine.

In addition, s. 4 of the Hazelwood Mine Fire Instructions sets out a number of other preventative measures that apply at all times, including:

- Smoking and carrying of cigarettes is prohibited in most areas of the Hazelwood mine.
- Welding, burning, cutting, grinding and use of open flame appliances and portable engines are strictly regulated and require permits.
- Strict procedures apply to the use, maintenance and cleaning of operational plant and equipment such as conveyors, machines and the Hazelwood Slot Bunker.
- Motor vehicles are not permitted to travel across coal faces without an approved exhaust system, and dozers and other vehicles are subject to a range of other requirements.[101]

MINE FIRE SERVICE POLICY AND CODE OF PRACTICE (REVISED JULY 2013)

The Mine Fire Service Policy and Code of Practice includes a statement that encapsulates GDF Suez's understanding of the risk of fire at the Hazelwood mine:

> Hazelwood Mine has suffered a number of fires over the years. Many of these have emanated from external "Bush Fires". Following a major fire in 1944 the Stretton Royal Commission made a number of significant recommendations relating to external forests and to internal water supply and sprays, which are still a major part of the Hazelwood Mine Fire Prevention Policy. However, fires have also been started from within the mine due to plant malfunctions. Notable amongst these have been fires on Dredgers and belt fires damaging belt, head ends and the rising conveyors. Fires have also been caused by vehicles and mobile plant due to coal deposited on hot exhausts igniting and dropping off to start a fire. Although many fires have started from outside, no fire has escaped the Hazelwood Mine and entered the external environment.
>
> Due to the methods employed for the extraction and use of Brown Coal in the Hazelwood Mine operations, large areas of brown coal are generally exposed in the operating faces, permanent batters and floor of the mine. Whilst the brown coal in its raw state is a high moisture fuel and difficult to burn, it weathers, dries and readily degrades to a fine dust which ignites easily under the right conditions, and can spontaneously ignite.
>
> Potential sources of ignition are frequently present in the form of electrical faults, faulty mechanical equipment, vehicle exhausts, metal cutting and welding activities, etc. A fire within the Hazelwood Mine can put all nearby machinery and equipment at risk particularly if coal spill or dust accumulates. In the mine, fire danger to personnel is not great provided that they are not trapped by machinery, buildings, or coal batters and provided that refuge is available from both heat and smoke. Although the effects of carbon monoxide need to be monitored in a large scale brown coal fire.
>
> Brown coal fires are best suppressed by the application of water. Wetting of the coal lays the coal dust, and helps to extinguish the fire and prevent it from spreading. Large quantities of water are required to extinguish deep seated burning, and often when burning coal is wetted, sufficient heat remains to dry out the surface again and to allow the fire to re-establish. Sometimes, it is best to dig out the batter where a fire is smouldering to completely remove any remnants of it.[102]

The Policy describes its purpose as follows:

> This Fire Service Policy and Code of Practice is based on the adoption of sensible precautions as well as the establishment of a system of fire protection in the Hazelwood Mine to:
>
> (a) protect all personnel within the open cut,
>
> (b) protect all plant and equipment required for the maintenance of coal winning operations, and
>
> (c) protect the brown coal reserves to enable continuation of coal winning activities.
>
> The aim is to prevent or extinguish any fire which may threaten the brown coal winning activities, and to restore normal operating conditions as early as possible after a fire. Training of all personnel in the fire fighting methods and procedures is an integral part of preparedness for combating fires.[103]

A number of mine procedures address prevention of fire, some of which have been discussed in relation to other policy documents above. In addition, the Mine Fire Service Policy and Code of Practice requires that a fire-break and control of grassed and forested areas be maintained within the 'zone of responsibility'. The zone of responsibility is defined as the area within the perimeter of the Hazelwood mine, plus those areas within the following distances of the operational area: northern side – one kilometre; western side – one kilometre; southern side – 0.5 kilometres; and eastern side – one kilometre.[104] The fire-break must meet the following requirements detailed in Figure 3.15.

Figure 3.15 Fire-break requirements under the Mine Fire Service Policy and Code of Practice[105]

Area	Requirements
Within 50 metres of the perimeter of the Hazelwood mine	A continuous and permanent fire-break corridor which is constantly monitored and in which: • grass is not to exceed 100 millimetres in height • no trees, shrubs, scrub are permitted.
From the outer edge of the 50 metre fire-break zone to the Hazelwood mine boundaries (in all directions) including all road verges	During the proclaimed fire season: • grass is not to exceed 100 millimetres in height • all combustible material/s to be removed, such as tree branches, scrub etc.
Within the zone of responsibility	Vegetation should primarily consist of: • scattered, tall, clean barked trees that have firm bark and an overall crown cover of less than 35 per cent (over any given treed area) with a minimum of 3 metres of open space between crowns of individual trees • grass and herbaceous understoreys that are kept short by grazing or mechanical means during those periods of high rural fire risk.

Under the Policy, the actively mined areas of the Hazelwood mine are to be protected by wetted corridors established along the working levels. Pipelines and sprays are to be provided such that if all sprays on working levels were to operate simultaneously under light wind conditions:

- A minimum of 50 per cent of exposed coal on working levels would be wetted at a rate of at least six millimetres of water depth per hour.
- The wetting down would be such as to provide intersecting corridors of wetted coal. The width of the wetted corridors should be a minimum of 50 metres. The unwetted coal areas should not exceed 12,500 square metres in area with a maximum dimension in any direction of 250 metres. Portable or readily relocatable sprays are to be used if necessary to achieve this requirement.[106]

The public hearings focussed on s. 3.4 of the Policy, which specifically addresses the 'worked out batters' of the Hazelwood mine:

> As a minimum requirement worked out batters are to be protected as follows:
>
> - All benches are to be clay covered.
> - All berms are to be eliminated by trimming or by filling with clay such as to shed fretted coal provided that batter stability calculations indicate that neither of these options will cause batter failure.
> - Tanker filling points are to be provided such that a tanker on any part of the worked out batters is within 5 minutes travel of a tanker filling point.
>
> NOTE: in the absence of tanker filling points a hydrant manifold will suffice. Fixed sprays should be used in conjunction with the droppers for the tanker filling points in order to provide wetted breaks.
> - Where possible access to areas worked out to be maintained.
>
> Alternatively:
>
> - Where practicable, fire break zones extending down to full depth of each batter may be utilised such that the length of exposed coal in any one batter is not greater than 500 m. These zones can be in the form of metalled vehicle access ramps or clay covering, a minimum of 8 m wide.[107]

The 'worked out batters' are considered to be those batters which are not in areas 'where excavation or transport plant operate, including working and transport levels, reserve coal areas, regular travel routes for dredgers and slew conveyors, and service corridors for essential operational services.'[108]

The Policy notes that the design and location of tanker filling points should involve consideration of 'ease of access, location and reliability of the water supply'.[109]

Water supply limitations are recognised by the Mine Fire Service Policy and Code of Practice, which provides that:

> In order to properly protect all parts of the Hazelwood Mine, pipe work and sprays are to be installed as laid down by this Fire Service Policy and Code of Practice. However, it must be understood that a larger water supply system would be required to run all the sprays and protection systems simultaneously. This policy provides for diversity in the simultaneous application of the fire protection water supplies and distribution.
>
> The maximum demand as defined in this Fire Service Policy and Code of Practice is an allowance of water usage upon which the design of the water supply system is based. The maximum demand rate of water use is considered to be sufficient to meet any likely contingency within the Hazelwood Mine. The distribution of this allowance of water usage is reasonably flexible for any situation but the use of more water than allowed for in one area may cause a reduction in the performance of the system.[110]

Section 7.1.1 of the Policy specifies the source of water supply must be designed so that supply is from at least two systems, such that the loss of the larger system or pumping station will not reduce the supply available below 50 per cent of the designed maximum demand.[111]

Section 7.1.2 of the Policy specifies that the system must be able to supply sufficient water to operate whichever is the greater of either Option A or B described below:

> Option A – Consisting of the sum of the following:
>
> - An allowance to operate rotary sprays to provide cover to 50 per cent of exposed coal and all machine and conveyor protection sprays on the working levels.
> - An allowance to operate three hydrants on one header on each of the working levels.
> - An allowance to operate the rotary sprays protecting one quarter of the length of the trunk conveyor system below grass level.
>
> Option B – Consisting of the sum of the following:
>
> - An allowance to operate rotary sprays to provide cover to 25 per cent of exposed coal and all of the machine protection sprays on the working levels.
> - An allowance to operate three hydrants on one header on each of the working level [sic].
> - An allowance to operate the rotary sprays protecting one half of the length of the trunk conveyor system.
> - An allowance to operate three hydrants per header for the headers protecting half of the length of the trunk conveyor system.[112]

EVOLUTION OF MINE FIRE SERVICE POLICY

The Mine Fire Service Policy and Code of Practice evolved from the Latrobe Valley Open Cut Mines - Fire Service Policy, which was produced by Generation Victoria prior to privatisation in 1994 (1994 Policy and Code).[113]

The 1994 Policy and Code replaced the Latrobe Valley Open Cuts Fire Protection Policy (Revision 1), dated November 1984, produced by the SECV (the predecessor to Generation Victoria) (1984 Policy and Code). The 1984 Policy and Code in turn was a revision of the SECV's Latrobe Valley Open Cuts Fire Protection Policy, dated December 1981 (1981 Policy and Code), which was developed following the review of the 1977 fire at the Hazelwood mine.[114]

Mr William Brown, former Fire Services Officer at the Hazelwood mine, told the Board that the 1994 Policy and Code and the predecessor versions developed by the SECV were the 'bible' for fire services at open cut brown coal mines in the Latrobe Valley.[115]

The 1994 Policy and Code was signed off by the mine managers of all three open cut brown coal mines in the Latrobe Valley (Yallourn, Loy Yang and Hazelwood), and applied to all three mines.[116] The policy contained requirements and operating procedures for fire protection services relevant to these open cut coal mines and their surrounding areas.[117] The 1994 Policy and Code states that it 'evolved over many years of open cut operation and draws on the experience gained from general fire service operation and from several major open cut fires,' including the 1944 fire at the Yallourn mine and the 1977 fire at the Hazelwood mine.[118]

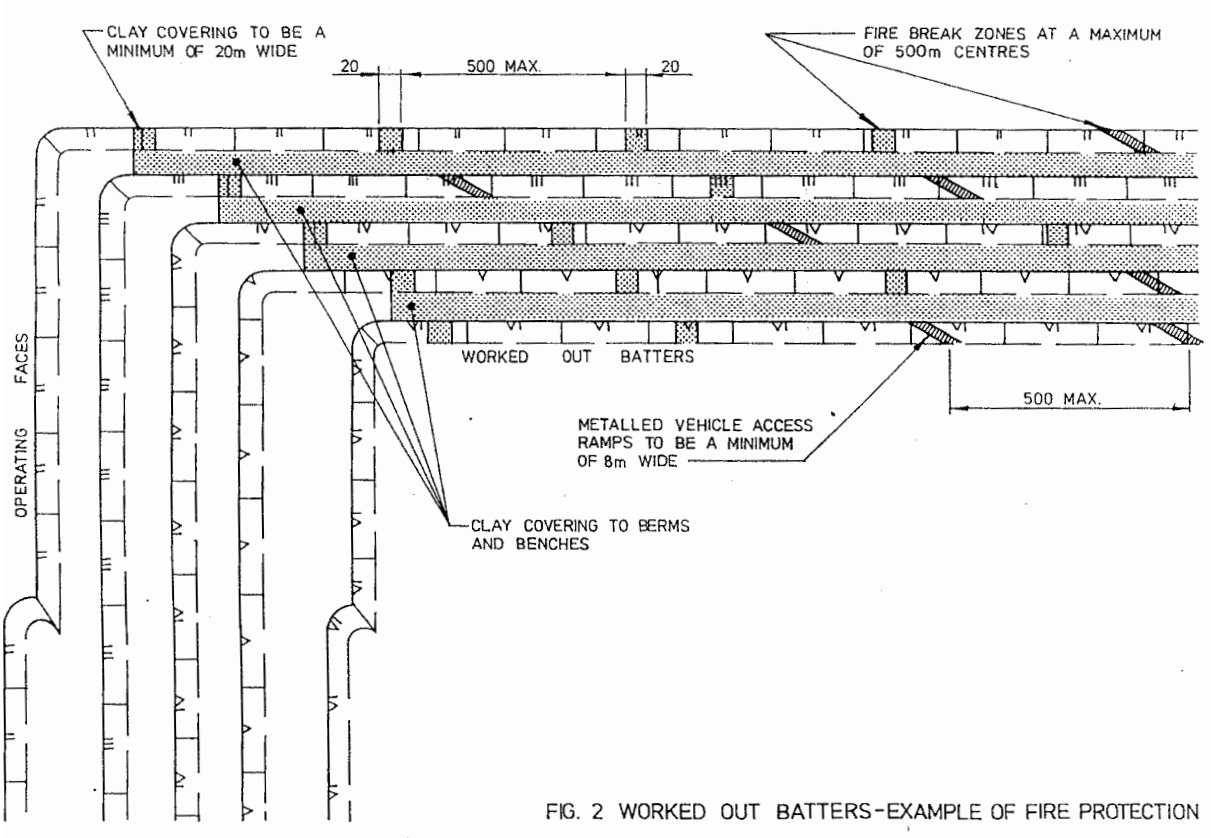
Section 1.1.4 of the 1984 Policy and Code dealt with fire prevention measures specifically directed to the worked out areas of all three Latrobe Valley mines:

> 1.1.4. Worked Out Batters (refer to fig 1.2)
>
> As a minimum requirement worked out batters are to be protected as follows:
>
> - All benches are to be clay covered.
> - All berms are to be eliminated by trimming or by filling with clay such as to shed fretted coal provided that batter stability calculations indicate that neither of these options will cause batter failure.
> - Fire break zones extending down to full depth of each batter may be utilised such that the length of exposed coal in any one batter is not greater than 500 m. These zones can be in the form of metalled vehicle access ramps, a minimum of 8 m wide or in the form of a 20 m width clay covering.
>
> Alternatively fixed spray breaks may be used, but it should be noted that water for these sprays has not been included under the maximum demand conditions, and this protection should not be considered as reliable as clay fire breaks or vehicle access ramps.
>
> Figure 2 shows an example of this protection.[119]

That is, the 1984 Policy and Code provided that, as a minimum, exposed coal in the worked out batters must be protected by either (a) the use of fire-break zones in the form of 20 metre wide clay covering or eight metre wide vehicle access ramps; or (b) fixed sprays.

Figure 2 of the 1984 Policy and Code is reproduced in Figure 3.16.

Figure 3.16 Worked out batters - example of fire protection (Figure 2 of the 1984 Policy and Code)[120]



Section 1.1.4 of the 1984 Policy and Code resulted from a recommendation made by the Review Committee inquiring into the fire at the Hazelwood mine on 4 to 6 November 1977. In its final report, the Review Committee recommended that the mine 'establish and implement a specific policy for the clay covering of dormant batters and levels. In developing this policy, consideration should be given to operational feasibility and economics of batter redesign to facilitate the application of clay cover.'[121]

The Review Committee also noted that immediately following the 1977 fire 'an accelerated programme of covering dormant levels and ramps within the [Hazelwood mine] was implemented and achieved during the summer period.'[122] However, the cost of providing a stable clay covering in the worked out open cut area had been assessed at $8 million for clay excavation, transport and covering, plus additional costs of between $5 and $10 million for relocation of existing infrastructure (roads, power lines, drainage etc). As a potentially more economical alternative, the mine operator had begun to explore the feasibility of flattening existing coal batters to allow for a thinner stable clay covering layer.[123]

The equivalent to s. 1.1.4 of the 1984 Policy and Code is found in s. 4.4 of the 1994 Policy and Code, which introduced an alternative measure:

> As a minimum requirement worked out batters are to be protected as follows:
>
> - All benches are to be clay covered.
> - All berms are to be eliminated by trimming or by filling with clay such as to shed fretted coal provided that batter stability calculations indicate that neither of these options will cause batter failure.
> - Tanker filling points are to be provided such that a tanker on any part of the worked out batters is within 5 minutes travel of a tanker filling point. Fixed sprays should be used in conjunction with the droppers for the tanker filling points in order to provide wetted breaks.

Alternatively

- Where practicable, fire break zones extending down to full depth of each batter may be utilised such that the length of exposed coal in any one batter is not greater than 500 m. These zones can be in the form of metalled vehicle access ramps or clay covering, a minimum of 8 m wide.[124]

In the lead up to privatisation of the Hazelwood mine, the 1994 Policy and Code was replaced by the Hazelwood Power Corporation Fire Service Policy and Code of Practice dated 8 November 1995. Mr Brown provided Revision 1 of this document, dated 4 December 1995, to the Board.[125] The equivalent provision was essentially the same in this version of the policy, except that a note was added that in the absence of tanker filling points, a hydrant manifold would suffice.[126]

Section 3.4 of GDF Suez's 2013 Mine Fire Service Policy and Code of Practice is substantially identical to the equivalent provision in the 1995 document, and the requirement has not been revised since that time.[127]

Accordingly, the minimum requirements under both the 1994 Policy and Code and the current (2013) Mine Fire Service Policy and Code of Practice are:

- Either tanker filling points or hydrant manifolds are to be provided within five minutes travel of any part of the worked out areas.
- Fixed sprays should be used in conjunction with droppers for the tanker filling points in order to provide wetted breaks.
- The use of fire-break zones in the form of access ramps or clay covering is provided as an alternative, rather than the primary means of prevention.

Mr Richard Polmear, GDF Suez Carbon Efficiency and Improvement General Manager, has been employed at the Hazelwood mine in a variety of roles since 1982, including roles in which he was responsible for fire services.[128] Prior to that, Mr Polmear was employed at the Yallourn open cut mine from 1980.[129] As submitted by GDF Suez, with over 30 years experience at the Hazelwood mine, Mr Polmear was uniquely placed to provide insight into why the changes occurred between the 1984 and 1994 Policies and Codes.[130]

Mr Polmear explained to the Board that at the time when the 1981 Policy and Code was drafted, mining at the Hazelwood mine was far less developed and 'there were no worked out batters at the Hazelwood Mine, there was no Loy Yang Mine; the only mine that had worked out batters was the Yallourn Mine.'[131]

According to Mr Polmear, the Yallourn mine is far less deep and the batter profiles are generally much flatter than at the Hazelwood mine.[132] Because the Hazelwood mine is deeper and the batter profile steeper, particularly in the northern batters, the use of clay covering as a fire break was not practicable in all parts of the mine at Hazelwood:

> … the proposal as proposed in [s. 1.1.4 of the 1984 Policy and Code], which worked in concept at Yallourn, doesn't work physically at Hazelwood because the overall slope is 3:1… [installing fire-breaks] would mean it would be one continuous slope from top to bottom, which means you've lost all access, you've lost any possible corridors for easements and the like. So the only way that you can cure that…[is] you actually have to go back further at the top to flatten it so that you've got access on benches. If you do that, then you actually have problems with the services that run at the top of those, so at that critical point just round the corner from where we've done rehab, it steepens up from about 6:1 to 3:1 overall slope. If you apply this rule at 500 metre intervals and you put the dirt in, then you end up with paddocks, but paddocks which are now inaccessible from top to bottom. So, if a fire does get in there, you can't get in to fight it.[133]

Mr Polmear considered that, for practical purposes, whilst the 1984 Policy and Code was in effect, the alternative of fixed spray breaks was the only option capable of being implemented at the Hazelwood mine.[134]

However, according to Mr Polmear, water supply was also a practical issue that complicated fire protection at the Hazelwood mine:

> The characteristics of the Mine created particular challenges as regards fire protection. It is much deeper than the Yallourn mine, with the result that the supply of water through reticulated fire service pipes is much more complex, as safe operation requires pressures to be maintained between 40 m and 115 m head on each level for static and maximum demand. At the Mine this requires 3 different pressure zones that could not be safely interconnected.[135]

REMOVAL OF PIPEWORK FORMING PART OF THE FIRE SERVICE NETWORK

The serviceability of fire service pipes in the northern batters at the Hazelwood mine became a significant issue in the early 1990s. Mr Polmear explained that pipes in the northern batters were installed between 1955 and 1980 and were some of the oldest at the mine.[136] The pipes installed throughout this period also had little or no internal or external corrosion protection and because of the acidic nature of coal, they were particularly susceptible to degradation.[137]

By 1990, corroded and failing pipes in the oldest areas of the Hazelwood mine, particularly around the northern batters, had become a significant problem because leaking water could enter the batter and cause batter movement and potential instability. Mr Polmear recalled one instance where a leaking pipe resulted in a two metre vertical movement in a batter.[138]

Repairing pipework required welding and was also problematic, as this process in itself creates a fire risk and in fact resulted in a number of fires in the worked out areas of the Hazelwood mine.[139]

Mr Polmear explained that in 1992, in light of the problems with ageing pipework, the SECV commissioned independent consultants, Richard Oliver International Ltd, to conduct a risk assessment for the purpose of seeking an exemption from complying with the requirements of ss. 1.1.4 and 1.1.5 of the 1984 Policy and Code in respect of the worked out areas, including the north-eastern and eastern batters, of the Hazelwood mine.[140]

In June 1992, Richard Oliver International Ltd produced a report titled 'Fire Risk Analysis of the Worked Out Areas of Morwell Open Cut', which concluded that:

> Exemption from ss.1.1.4 and 1.1.5 would increase fire risk in the worked out areas and would increase SECV and [Hazelwood mine] liability in this regard. Presently this risk is not minimal. An exemption is thus not appropriate.
>
> Moreover any such policy exemption or modification should not proceed until there has been a demonstrable reduction in fire risk.[141]

The report made a number of further observations relevant to this Inquiry:

- As at 1992, around eight per cent of the total plan area of the worked out areas of the Hazelwood mine consisted of exposed coal, that is, areas not covered by either clay covering or sprays.[142]
- As at 1992, the water supply to the worked out areas appeared satisfactory, but 'could be a little greater (perhaps 20 per cent more) than policy requirement for the worked-out areas and batters' to cover remaining exposed coal.[143]
- 'With all but 8 per cent of the plan area of the worked-out areas and batters covered by water or clay, significant spread of fire through the worked-out areas does not appear to be a key threat.'[144]
- As a result, the policy (as it then was) addressed the risk of fire spreading in the worked out areas, but spread of fire may result from (among other things) 'embers or coal or foliage fires blown by the wind.'[145]
- From November 1989 to April 1992, there were 28 fires reported in the worked out areas. In these prior incidents, piped water was the major means of fire suppression.[146] This was a reference to the reticulated water system in the northern batters.[147]

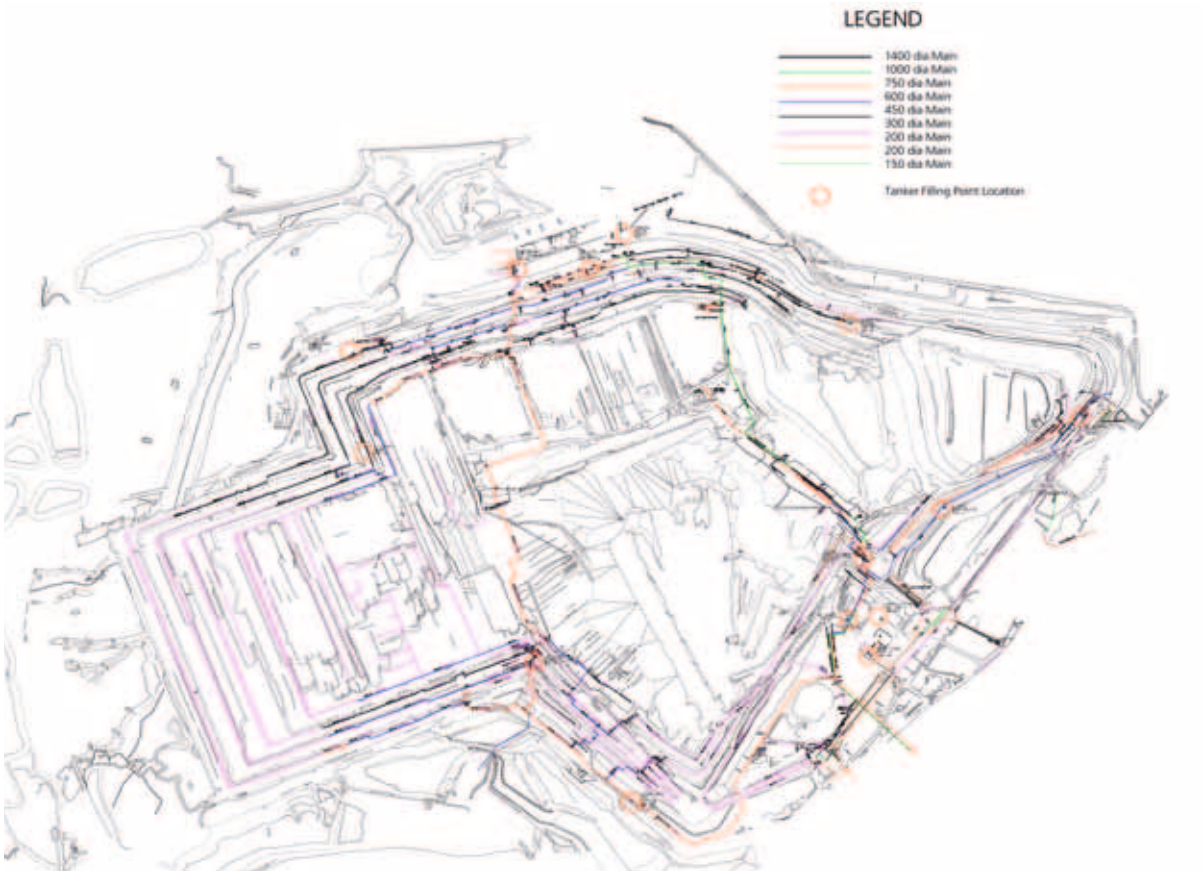
- Risk to the safety of personnel arising from a fire in the worked out areas was identified as minimal and a loss of life 'would not be anticipated.'[148]
- However, 'corporate image' and 'other community impact outside the mine' were identified as potential consequences of any fire in the worked out areas of the Hazelwood mine.[149]

The report recommended that the SECV carry out a detailed engineering survey of the reticulated fire services water system, including an assessment of the northeast corner coal production area, and that this survey should cover maintenance, design and pump aspects.[150] In terms of potential revisions to the 1984 Policy and Code, the report suggested that the number, distance and capacity requirements for tanker filling points should be specified.[151]

Despite the results of the 1992 risk analysis, s. 1.1.4 was revised in the 1994 Policy and Code such that clay or fixed spray breaks were no longer a minimum fire protection requirement so long as tanker filling points were provided within five minutes travel of any part of the worked out areas.

Following this revision to the Policy and Code, until around 2007, any degraded or leaking pipework was progressively removed from the northern batters,[152] principally in the area that was affected by the Hazelwood mine fire in 2014.[153] The fire service network as it existed immediately prior to the Hazelwood mine fire is shown in Figure 3.17.

Figure 3.17 Fire service network as at 9 February 2014[154]



Pipework was only ever removed from the northern batters as a result of it becoming unserviceable, with the exception of pipework removal due to the:

- development of the internal overburden dump (during the period 1998–2003)
- construction of the Hazelwood Ash Retention Embankment (which followed the creation of the internal overburden dump).
- completion of rehabilitation works in 2007/2008.[155]

When Mr Polmear was asked why these pipes were not replaced once they had been removed, his answer was 'they didn't need to be, in accordance with the policy.'[156]

During the Hazelwood mine fire, extensive pipework was installed in the worked out areas of the Hazelwood mine in order to assist with the fire suppression effort. This is detailed in Chapter 2.3 Fighting the Hazelwood mine fire.

Mr Polmear confirmed that the pipework removed during the period 1994 to 2007 corresponded with the area of the northern batters where pipework was installed during the Hazelwood mine fire.[157] After 1992, no risk assessment was conducted to determine whether any removed pipework should be replaced.[158]

During the Inquiry's public hearings, there was debate as to whether GDF Suez was entitled to depart from the fire service network depicted in the 1996 work plan without the Mining Regulator approving a variation of the work plan. In his expert opinion to the Board, Mr Roderic Incoll, Bushfire Risk Consultant, suggested that alterations to the fire service network were unauthorised and ought to have attracted the attention of the Mining Regulator.[159] Ms White also initially gave evidence that such a modification would require a variation to the work plan.[160]

GDF Suez submitted that the 1996 work plan merely referred to the existence of the fire service network and the inclusion of a diagram of that network did not constitute a fixed requirement without which the commitment to the overall policy was breached.[161] GDF Suez claimed, in effect, that the operative requirement under both the 1996 work plan and 2009 work plan variation adhered to the 1994 Policy and Code, and having regard to the flexible fire protection options provided under that policy, it would be illogical and unreasonable to 'set in stone' the fire service network as it existed in 1996.[162]

Ms White ultimately agreed with GDF Suez's proposition that as long as the standards in the 1994 Policy and Code continued to be met, that would constitute compliance with the requirements of clause 7.7 of the approved work plan.[163]

PREVENTING FIRE IN THE WORKED OUT AREAS OF THE HAZELWOOD MINE

Mr Incoll explained to the Board that:

> Fire is an ever-present hazard and enemy of production that can arise from many causes internally and at times can arise unseen from outside the Mine... One way this can occur is by the ignition of exposed coal in the Mine by fires burning in the rural landscape, either by direct flame attack or ignition by wind-bone [sic] burning embers.[164]

GDF Suez's main strategy for preventing the outbreak of a mine fire as a result of an external fire has been vegetation management in the rural land surrounding the Hazelwood mine, by grass slashing, grazing, and fire-breaks.[165]

While vegetation management can be an effective strategy against a direct firefront, it does not address the risk of mass ember attack into the Hazelwood mine from external sources resulting in widespread simultaneous ignitions (the likely cause of the Hazelwood mine fire in 2014).[166] The key issue for resolution, therefore, is '[t]he protection of exposed coal that ignites easily on hot, dry windy days.'[167] Given the scale of mining at the Hazelwood mine, the extent of the area of exposed coal to be protected is a major factor in the challenge of protecting the mine from fire.[168]

According to Mr Incoll, '[e]ffective fire protection of a mine of this size from ignition by flames or embers from outside the mine can only be achieved by either covering exposed coal with earth and/or a water spray to wet down coal faces.'[169] Mr Faithful agreed.[170] Independent expert, Professor David Cliff, Professor of Occupational Health and Safety in the Minerals Industry and Director, Minerals Industry Safety and Health Centre at the University of Queensland, put it to the Board that: 'fundamentally, if the coal can't be exposed to air, it can't burn; it's as simple as that.'[171]

From this perspective, Mr Incoll considered that the fire prevention measures contained in the Mine Fire Service Policy and Code of Practice and related policies were inadequate to protect against the risk of fire in the worked out areas of the Hazelwood mine.

Mr Incoll reported to the Board that under the Mine Fire Service Policy and Code of Practice the strict rules regarding vegetation that govern the fire break zone surrounding the perimeter of the Hazelwood mine do not apply to worked out areas within the Hazelwood mine. Vegetation of the nature and density observed by Mr Incoll in May 2014 within areas of the mine obstructs access for firefighting, makes it difficult to suppress embers with water sprays and if ignited under hot dry windy conditions may become a scrub fire.[172] Mr Incoll recommended that it be addressed.

Mr Incoll also reported to the Board that the water supply for the fire service network is inadequate and there are no water coverage requirements specified for the use of fixed spray breaks in worked out areas. The effective cover of exposed coal surfaces with water sprays requires a reticulation system capable of delivering water in the volumes required for dampening down exposed coal in all sectors of the mine.[173]

Further, the use of fire-break zones on worked out batters was not implemented and exposed batter lengths exceeded 500 metres. Even if fire-breaks were effective in containing fire to a 500 metre section of the mine, this would represent an extensive firefront to deal with under hot dry windy conditions.[174]

Mr Incoll told the Board that the minimum requirements under s. 3.4 of the Mine Fire Service Policy and Code of Practice:

> …may well be adequate, I think they're intended for internal protection of the mine where you have limited fire and not under total fire ban weather conditions, but they're not when you're looking at widespread fires started by an ember shower. It's my firm conviction, as I've said, it has to be either covered with some sort of a blanket of earth or another substance or covered by water to resist that type of attack.[175]

Mr Incoll concluded:

> In my opinion considering the outcome of the recent fire, anything less than 100 per cent spray coverage availability during hot dry windy conditions, or full earth covering of the Northern Batters is inviting a recurrence of the incident with similar outcomes. For this reason this situation must be permanently remedied.[176]

In his initial written submission, Mr Incoll recalled that '[t]he standard response of the open cut fire services under the [SECV] arrangements on hot dry windy days at any time of the year, was to start up large scale irrigation systems that covered exposed coal faces with a water spray.'[177] During the public hearings, Mr Incoll confirmed that he had personally witnessed this happen.[178]

Mr Freshwater told the Board:

> For fire safety, pipelines and sprinklers were installed to the whole of the mine, including the worked out areas. The sprinklers produced a rotating fine mist of water… On days when it was hot or a fire danger day, the fire service personnel would arrive at work very early and turn on the sprinklers which would wet down the coal levels and batters.[179]

Mr Freshwater also noted that fire service personnel used to ensure that all vegetation in the mine was removed.[180]

GDF Suez submitted that observations regarding the current adequacy of water supply were based on a misapprehension of the coverage of the fire service network during the 'good old days' of the SECV.[181] As noted above, neither the current Mine Fire Service Policy and Code of Practice nor the 1994 Policy and Code required 100 per cent coverage for operational areas of the Hazelwood mine and explicitly stated the system was incapable of such coverage.

When this was put to Mr Incoll, he accepted that this was what the policy said, but his impression at the time was that in fact, the fire service network could produce 100 per cent coverage.[182] Furthermore, Mr Incoll confirmed that as a preventative measure it was possible to manage the water supply so that, over the course of a morning, areas that need to be wetted down could be wetted down sequentially and that is what had occurred in the past.[183]

Mr Incoll identified rehabilitation as a routine method of covering exposed coal that could be used as a fire prevention method.[184] The value of rehabilitation as a fire prevention measure was also known both to GDF Suez[185] and the Mining Regulator.[186]

However, Mr Faithful outlined a number of obstacles (see under the heading 'Approved rehabilitation plan for the Hazelwood mine' above) that make progressive rehabilitation a complex, costly and time-consuming exercise. The practical limitations of rehabilitation as a fire prevention measure were also recognised by Mr Leonard Neist, Executive Director, Health and Safety, VWA,[187] Ms White,[188] Professor Cliff,[189] Mr Gaulton[190] and Mr Freshwater.[191]

According to Mr Faithful, it would be considerably more costly to accelerate rehabilitation of the northern batters from the existing 2009 rehabilitation plan and any attempt to do so would be constrained by consultation and agreement with a range of third parties.[192] The additional cost of accelerating progressive rehabilitation is primarily due to the need to remove infrastructure earlier than anticipated and difficulties with sourcing suitable overburden material outside of the planned mining sequence.[193]

Environment Victoria submitted that none of the factors identified by Mr Faithful necessarily precludes accelerated progressive rehabilitation of the worked out areas of the Hazelwood mine,[194] suggesting:

- The steps identified by Mr Faithful as being required for rehabilitation would be required no matter when rehabilitation occurred.[195]
- The particular steps required for rehabilitation were not impediments in the sense that GDF Suez would lack the capability to undertake them, or that they would preclude progressive rehabilitation occurring.[196]
- Mr Faithful recognised the possibility of importing overburden from different parts of the mine, sourcing it specifically for rehabilitation rather than relying on coal mining by-product, or sourcing it externally.[197]
- GDF Suez had not provided any evidence of any investigations it had made about sourcing overburden from other parts of the mine, sourcing it from the over burden dump or sourcing it externally.

A number of witnesses canvassed the potential of capping exposed coal with clay or some other fire retardant substance as an alternative fire protection method to complete rehabilitation.

Mr Gaulton raised the possibility of coating exposed coal with 'a fire protectant such as stabilised clay and cement mixture', such as 'shotcrete' that could 'provide and [sic] interim fire prevention measure until the batters can be fully rehabilitated.'[198]

Professor Cliff described permanent rehabilitation as the 'ultimate solution' but suggested temporary capping was commonly used in the mining industry to treat stockpiles or waste heaps of coal that have the potential to spontaneously combust.[199] Examples of treatments that might potentially be used include fly ash slurries, foams, gels, organic surfactant materials, polymers, bituminous tar, a form of clay, 'shotcrete', or some other form of cementation.[200]

GDF Suez submitted that there was no evidence that any of these measures had been trialled as a fire prevention measure in open cut brown coal mines anywhere in the world.[201] As Mr Gaulton noted, this might be because the Latrobe Valley is unique in that '[t]his is the only place in the world where huge massively thick seams of brown coal are mined and exposed to the atmosphere with the intrinsic consequences of that.'[202] Mr Gaulton told the Board that 'shotcreting' and other treatments had been used in potentially similar applications, for example, as a treatment applied to both underground and high batters of open cut mines to enhance stability.[203] Such treatments have been used in open cut black coal mines in Queensland.[204]

GDF Suez identified other potential issues associated with capping exposed coal with clay or some kind of fire retardant treatment:

- If a treatment was applied to worked out batters without reshaping works having first been undertaken, this could impact on benches, roads, drains, bund walls and general access.[205]
- The impact of such works on horizontal bores in the northern batters would need to be carefully managed, so that de-watering was not disrupted, giving rise to stability issues.[206]
- Flattening batters could increase the risk of fire by increasing the surface area of exposed coal.[207]
- Applying a surface treatment could involve exposing workers to risks by having to work at heights.[208]
- It is an important element of batter stability management that batters be visible and readily accessible and a superficial coating to worked out batters could impede routine geotechnical inspections and the maintenance of batter stability.[209]

Based on some of the issues identified above, Environment Victoria preferred permanent rehabilitation to temporary capping.[210] It also identified other factors that made rehabilitation superior to temporary capping and wetting down coal faces with sprays:

- Because full rehabilitation involves the 'laying back' of the batters, reducing their steepness, the batters are more accessible to firefighters.
- Having a less steep slope would mean stability issues would not need to be dealt with on an ongoing basis and visual inspection of batters would no longer be required.
- Once completed properly, rehabilitation is immune from human error and technological failure. Unlike water protection, there would be no reliance on decisions by people to activate a water protection system, nor does rehabilitation rely on technological aspects such as having access to electricity and pipes not failing.[211]

There was also evidence suggesting that not all of the obstacles identified by GDF Suez were insurmountable. For example, Professor Cliff told the Board that:

- Existing coal treatments had been successfully applied to vertical or near vertical coal faces.[212]
- Fly ash slurries can be easily applied to steep batters and at heights using equipment similar to that used by the CFA to apply foam during the Hazelwood mine fire.[213]
- Contrary to the suggestion that flatter batters might present a higher fire risk due to a greater surface area, steep vertical coal faces in fact present a greater fire risk due to the effect of convection updrafts.[214]
- Open cut coal mines in New South Wales and Queensland, commonly rely on methods other than visual inspection, such as ground-penetrating radar and other 3-dimensional scanning systems, to monitor batter stability. As such, this is not necessarily an obstacle to applying a fire retardant to exposed coal.[215]

Further, in Mr Gaulton's opinion, the application of a surface treatment would not necessarily obstruct a horizontal drain, as the bore hole casing usually projected around a metre from the coal face.[216]

While the level of optimism surrounding the prospect of capping exposed coal varied considerably, there was a consensus that a risk assessment would need to be undertaken before any option or combination of options was adopted.[217]

OCCUPATIONAL HEALTH AND SAFETY

OCCUPATIONAL HEALTH AND SAFETY MANAGEMENT SYSTEM STANDARDS

The 2009 work plan variation states that GDF Suez is compliant with AS4801.[218] AS4801 is an Australian and New Zealand Standard for occupational health and safety management systems (OHSMS). The Standard is designed as a framework primarily for independent external audits and reviews of an organisation's OHSMS, but it can also be used as a framework for internal audits.[219]

The purpose of AS4801 is to specify:

> requirements for an occupational health and safety management system (OHSMS), to enable an organisation to formulate a policy and objectives taking into account legislative requirements and information about hazards or risks. It applies to those hazards or risks over which the organisation may exert control and over which it can be expected to have an influence.[220]

The Standard may be used by any organisation that wishes to:

- implement, maintain and improve an OHSMS
- assure itself of its conformance with its stated OHS policy
- demonstrate such conformance to others
- seek certification/registration of its OHSMS by an external organisation, or
- make a self-determination and declaration of conformance with the Standard.[221]

It is intended that all requirements under the Standard are incorporated into the organisation's OHSMS, however 'the extent of the application will depend on such factors as the OHS policy of the organisation, the nature of its activities and the conditions in which it operates.'[222] As such, AS4801 is a voluntary standard, which an organisation may choose to partially implement according to its needs.

Professor Cliff told the Board that compliance with AS4801 requires a risk assessment process to be undertaken in respect of all hazards in a workplace, not just hazards with the potential for multiple fatalities such as 'major mining hazards.'[223]

The definitions of key concepts which apply under the Standard are detailed in Figure 3.18.

Figure 3.18 Definitions of key concepts under AS4801[224]

Term	Definition	Paragraph of AS4801
Control of hazards/risks	The process of elimination or minimization of risks.	3.4
Hazard	A source or a situation with a potential for harm in terms of human injury or ill-health, damage to property, damage to the environment, or a combination of these.	3.5
Hazard identification	The process of recognizing that a hazard exists and defining its characteristics.	3.6
Hazard/risk assessment	The overall process of estimating the magnitude of risk and deciding what actions will be taken.	3.7
Incident	Any unplanned event resulting in, or having a potential for injury, ill-health, damage or other loss.	3.9
Risk	(In relation to any potential injury or harm) The likelihood and consequence of that injury or harm occurring.	3.18
Safety	A state in which the risk of harm (to persons) or damage is limited to an acceptable level.	3.19

The Standard requires that an organisation establishes and maintains an OHSMS in accordance with the following requirements (among others):

- Paragraph 4.4.6.1: The organization shall establish, implement and maintain documented procedures to ensure that the following are conducted -
  - (a) hazard identification
  - (b) hazard/risk assessment
  - (c) control of hazards/risks; and then
  - (d) evaluation of steps (a) to (c).

- Paragraph 4.4.6.2: The identification of hazards in the workplace shall take into account:
  (a) the situation or events or combination of circumstances that has the potential to give rise to injury or illness
  (b) the nature of potential injury or illness relevant to the activity product or service; and
  (c) past injuries, incidents and illnesses.
- Paragraph 4.4.6.3: All risks shall be assessed and have control priorities assigned, based on the established level of risk.
- Paragraph 4.4.6.4: All risks, identified through the assessment process as requiring control, shall be controlled through a preferred order of control methods (commonly referred to as a hierarchy), based on reasonable practicability. Elimination shall be the first control method to be considered.[225]

The Standard also notes that while undertaking hazard identification and hazard/risk assessments consideration should be given to adverse conditions arising from:

- normal operating conditions
- abnormal operating conditions, including shut-down and start-up conditions, inclement weather and foreseeable misuse
- incidents, and potential emergency situations
- past activities, current activities and planned activities.[226]

In the context of an incident such as a bushfire, this means hazard identification and risk assessments should consider adverse conditions such as weather conditions, the proximity of plantations, power failures, insufficient water supply and the unavailability of CFA resources during extreme bushfire risk weather due to other fire emergencies in the region.

During the public hearings, Mr Incoll suggested that a risk assessment would take into account the potential loss of power or water supply and, if that is likely to happen, consider what alternative supply arrangements are available.[227]

Professor Cliff further noted that as part of a risk assessment, it would not be unreasonable to assume that the capacity of the CFA to respond could be hampered by the need to deal with other fires in the region during peak fire season. According to Professor Cliff, if a thorough risk assessment is carried out, issues such as incapacity of the CFA to respond, the loss of power, faulty pipes and pumps could all be flagged as potential problems and additional controls put in place.[228]

THE GDF SUEZ SAFETY MANAGEMENT SYSTEM

As Hazelwood mine is a 'prescribed mine', GDF Suez is required to have a safety management system under r. 5.3.21 of the Occupational Health and Safety Regulations 2007 (Vic) (OHS Regulations) (see Chapter 3.2 Regulation of fire risk at the Hazelwood mine).

GDF Suez provided to the Board a folder comprising 21 documents and running to several hundred pages, which it submitted constituted its Safety Management System (SMS) prepared in accordance with r. 5.3.21 of the OHS Regulations.[229] GDF Suez did not provide the Board with a copy of the Safety Management System Manual (document 1 of the GDF Suez SMS) until the evening prior to Professor Cliff giving evidence on 12 June 2014. The complete 21 document GDF Suez SMS was provided to the Board after Professor Cliff gave evidence.[230]

Document 1 of the SMS is the GDF Suez Safety Management System Manual. According to the Manual, the SMS 'aims to apply best practice hazard management techniques to systematically identify and manage the Health and Safety risk that may be associated with the business of the company' and is designed to comply with the requirements of various standards, including AS4801.[231]

Document 2 of the SMS is the GDF Suez Health and Safety Policy. Under this Policy, GDF Suez commits to:

- taking a proactive approach to health and safety requirements at all levels of the business and in all decision-making processes
- meeting or exceeding all health and safety statutory obligations
- maintaining a SMS and regularly reviewing its effectiveness to achieve improvement: 'The effective Health and Safety Management System will be certified to comply with OHSAS 18001 and AS/NZS 4801'
- identifying, reporting investigating and resolving all safety related incidents, taking action to prevent recurrence and monitoring the effectiveness of control methods.[232]

Document 3 of the GDF Suez SMS is entitled 'Hazard Identification Risk Assessment and Control'. It documents 'the method by which risks and hazards at IPR-GDF Suez Hazelwood will be managed, identified, recorded, assessed and controlled.'[233] Clause 5 of this document, under the heading 'Hazard Identification' recognises GDF Suez's obligation under r. 5.3.23 to 'conduct a comprehensive and systematic safety assessment to provide a detailed understanding of all aspects of risks to health and safety associated with major mining hazards.'[234]

The Board notes that there is no reference in cl. 5 or elsewhere in the Hazard Identification Risk Assessment and Control document to the identification of mining hazards falling short of the definition of 'major mining hazards', that is hazards such as mine fires that do not have the potential to cause more than one fatality.

Under cl. 12 of the Hazard Identification Risk Assessment and Control document, 'all hazards identified shall have a risk assessment conducted…to determine the likelihood and the probability of consequences from a hazard.'[235] However, the requirement to conduct risk assessments in relation to all identified hazards is limited to 'major mining hazards', as this is the only type of hazard required to be identified under cl. 5.

Document 4 of the SMS is the GDF Suez Hazard and Risk Register, which bears the subtitle 'Risk Assessments of Major Health & Safety Hazards at GDF Suez Hazelwood, Power Station and Mine.'[236] Notwithstanding the reference to 'major hazards' in the subtitle, this document purports to be a comprehensive analysis of all mining hazards at the mine (not just major mining hazards), and identifies hazards, likelihood, consequence, risk rating, control measures and residual risk.[237]

The Hazard and Risk Register is 44 pages long and identifies 102 hazards. The hazard of most interest to the Board is 'Fire'.[238] The Register makes reference to major and minor fires but only in the operational areas of the mine (ie dredgers and station bunkers). It notes that there are 'minimum risks to personnel' and higher risk to plant and buildings.[239] However it makes no reference to the hazard of fires in the worked out areas of the mine, nor does it refer to the possible consequence of harm to people outside the mine.

Due to the late provision of the GDF Suez SMS to the Board, Professor Cliff was not able to express any opinion in his expert report as to whether it satisfied r. 5.3.21 of the OHS Regulations. However, in the course of giving evidence during the public hearings and after only having reviewed the Safety Management System Manual (document 1 of the GDF Suez SMS) that morning, Professor Cliff noted that 'the development of a safety management system under the legislation relates to mining hazards as well as major mining hazards' and he 'had no evidence of the risk assessments that would underpin them.'[240]

SAFETY ASSESSMENT

Under r. 5.3.23 of the OHS Regulations, GDF Suez is also required to conduct a comprehensive and systematic Safety Assessment in order to assess the risks associated with major mining hazards (see Chapter 3.2 Regulation of fire risk at the Hazelwood mine).

From 2003 to 2004, a Major Mining Hazards Safety Assessment comprising the following four documents was prepared for GDF Suez with the assistance of Qest Consulting:

- Safety Assessment of Major Mining Hazards: Stage 1 – Identification of Major Mining Hazards (dated December 2003)
- Safety Assessment of Major Mining Hazards: Stage 2 – Semi-Quantitative Risk Assessment (dated February 2004)
- Safety Assessment of Major Mining Hazards: Stage 3 – Critical Control Adequacy Assessment & Reduced Case Risk Assessment (dated March 2004)
- Executive Summary: Safety Assessment of Major Mining Hazards (dated April 2004).[241]

The Executive Summary describes the Safety Assessment process as follows:

> The assessment was aimed at achieving compliance with the requirements for a Safety Assessment as per the Occupational Health and Safety (Mines) Regulations 2002. A Major Mining Hazard is defined under these Regulations as; "a mining hazard that has the potential to cause an incident that causes, or poses a significant risk of causing, more than one death"[242]

As part of the 2003/2004 Safety Assessment, GDF Suez identified 53 mining hazards, of which 17 were considered to be major mining hazards. Relevantly, a 'major mining plant fire' was identified as a major mining hazard and was evaluated as being a 'rare' occurrence but with potentially 'catastrophic' consequences.[243]

Professor Cliff explained that the term 'catastrophic' in the context of risk assessments is a term of art and refers to 'things that have the potential for significant harm like multiple fatality or very large economic or health effects from limited events.'[244]

For the purposes of the 2003/2004 Safety Assessment, major mining plant fires were characterised as set out in Figure 3.19.

Figure 3.19 Extract from Appendix 1 to 'Safety Assessment of Major Mining Hazards: Stage 1 – Identification of Major Mining Hazards' [245]

MH No. Hazard	IPH-NO7
Hazard Name	Major mining plant fire
Description	Conveyors, stacker, dredger. Dredger considered biggest risk issue. Areas of concern: Coal build up and mechanical failure.
Causes	1. Electrical / mechanical failure 2. Grease build up 3. Coal build up 4. Hot work 5. Housekeeping 6. External fire 7. Lightning 8. Spot fire from vehicle / plant 9. Belt fire
Consquences/ Hazard Effect	5 Catastrophic
Likelihood / Probability	E Rare
Risk	MEDIUM
Controls (Preventative)	1. PM (Condition monitoring, Lubrication), Shiftly inspection, Temperature censors /protection. 2. Degreasing of plant, Shift inspections. 3. Design to prevent spillage, PM, cleaning daily or on request (hose down / shovel clean), shiftly inspections, safety walks. 4. Permit system, Follow up inspections, Training of fire man / spotter for Hot Work. 5. Cleaning daily or on request (hose down / shovel clean), shiftly inspections, safety walks. 6. Perimeter slashing, Fire brakes, On-site fire fighting tankers. 7. Lightning rods on major plant. 8. Modified exhausts, Modified braking systems, vehicle washing, PM, Ongoing inspection, Diesel powered vehicles. 9. Preventative maintenance program, Shiftly fault inspections, competent maintenance personnel / operators, works management system (priority for safety items), FRAS belts.
Controls (Mitigation)	Fire extinguishers on all plant. Monthly visual inspection of extinguishers, Annual testing of extinguishers, Reticulated fire water protection to all major mining plant. Annual training in fire fighting. LV fitted with hoses. Escape routes from MMP, Emergency response procedures. Adequate fire water pressure and supply. Annual spray pattern testing. On-site fire fighting tankers.

It can be seen from Figure 3.19 that the 2003/2004 Safety Assessment was focused on the causes, likelihood and consequences of a major fire breaking out in those parts of the mine where coal is actively mined.

In October 2009, GHD was commissioned to facilitate Safety Assessments concerning major mining hazards at the Hazelwood Mine.[246] GHD's work culminated in a report titled 'Report for Major Mining Hazards Assessment: Interim Submission', dated 22 December 2009.[247]

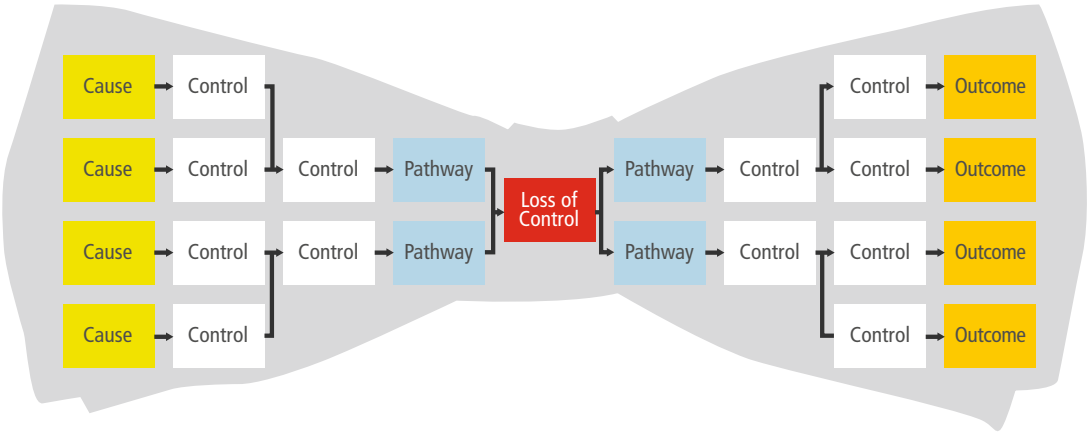
The Safety Assessments were conducted using a team-based approach over the course of four workshops in December 2009, which were attended by consultants from GHD, GDF Suez personnel working in various capacities at the Hazelwood mine, and others.[248]

The Safety Assessments involved:

- reviewing the 2003/2004 work referred to above to assess recognised major mining hazards against the definition of major mining hazards in the OHS Regulations
- using the workshop exercise 'to identify representative, reasonable and thoroughly defined risk scenarios that have the potential to lead to a multiple fatality'
- for each scenario, identify current controls and select 'Critical System' and 'Risk' controls
- develop performance standards for all identified 'Critical System' and 'Risk' controls.[249]

As part of the Safety Assessment, 'bow-tie' diagrams were developed for each of the 17 identified major mining hazards.[250] A bow-tie is a diagrammatic representation commonly used in risk assessments that identifies the causes, outcomes and risk controls for a particular hazard. An example of a bow-tie diagram is depicted in Figure 3.20 below.

Figure 3.20 Bow-tie diagram format[251]



Professor Cliff explained that:

> A normal bow-tie diagram has an event, an unwanted event in the middle, the knot in the bow-tie. On the left-hand side you have the causes, on the right-hand side you have all the consequences, and between the causes and the event, you have the preventative controls; between the unwanted event and the consequences you have the mitigated controls. Now, controls are actions, barriers, that prevent or mitigate the event. So they're not things like a piece of paper or a plan, they are firefighting system, they are automatic controls, they are evacuation, they are self-contained self-rescuers, so they are things you can identify as being able to control something.[252]

Prior to the workshop process, earlier versions of bow-tie diagrams produced in 2004 were validated and updated by a team consisting of a GHD consultant, a member of the mine's management, the Mine Asset Manager and a safety representative. This process involved itemising 'all known, reasonably foreseeable causes associated with each [major mining hazard] group.'[253] The workshops then reviewed the bow-tie diagrams in detail, discussing the credible risk scenarios and controls.[254]

Relevantly, the bow-tie diagram for 'mine fire' identifies bushfire and spontaneous combustion as potential causes.[255]

The 2009 GHD report recommended that GDF Suez carry out the following tasks:

- risk assessments for each of the scenarios for the seventeen identified major mining hazards illustrating that risk has been reduced to as low as reasonably practicable
- develop performance standards around each of the critical system and risk controls identified during the safety assessment workshops, including an assessment of the current adequacy of each control.[256]

As noted in Chapter 3.2 Regulation of fire risk at the Hazelwood mine, on 20–21 June 2012, VWA conducted a verification inspection of the Hazelwood mine in relation to mine fires arising from operational plant.[257]

On 21 June 2012, VWA inspector Mr Hayes issued an improvement notice requiring GDF Suez to 'conduct a comprehensive and systematic Safety Assessment in order to assess the risks associated with the major mining hazard, mine fires.'[258]

In the improvement notice, Mr Hayes noted that:

- The 2009 GHD report recommended that 'risk assessments are to be carried out for each of the scenarios for the MMHs [major mining hazards] illustrating that risk has been reduced to as low as reasonably practicable.'
- The operator of the Hazelwood Mine informed him that the risk assessments contemplated by the 2009 report were incomplete.
- The Safety Assessment documentation relating to 'mine fires' he observed was incomplete and unfinished.
- 'If a mine fire was to occur whilst employees are performing duties within the mine, the fire has the potential to cause an incident that would pose a significant risk of causing, more than one death due to asphyxiation or burns.'
- 'A failure to assess the risks associated with the Major Mining Hazard Mine Fires and to conduct a comprehensive and systematic Safety Assessment in accordance with regulation 5 3.23, may lead to hazards and failure scenarios not being identified and risk control measures not being implemented, thus exposing employees to a mine fire. A mine fire has the potential to result in multiple fatalities.'[259]

In response to the improvement notice, a working party of GDF Suez employees met on 4–5 October 2012 to review the risk scenarios, control measures and performance measures set out in the existing bow-tie diagram for mine fire and evaluate whether the risk had been reduced to as low as reasonably practicable.[260]

The working party determined that a mine fire satisfied the definition of a 'major mining hazard' under the OHS Regulations and agreed that to define a major mine fire as 'any fire that is beyond the capability of the mine fire crews in attendance and requires external resources (CFA) or cannot be controlled within 30 minutes.'[261]

As a result of the working party review, several scenarios, risk controls and performance measures were revised. In particular, a new mine fire scenario was developed to address the risk of fire developing from geological hot spots.[262]

Following the working party review, in October 2012, a new bow-tie diagram and revised system control descriptions were developed for 'major mine fires'.

On 8 October 2012, VWA conducted a follow-up visit and found that the review of the Safety Assessment had been completed to the satisfaction of the VWA, and that GDF Suez had complied with the improvement notice.[263]

The updated bow-tie diagram identified 'bushfire', 'spontaneous combustion' and 'hot spots' as potential causes of a major mine fire. For bushfire, the following preventive controls were identified:

- weather monitoring (under the Mine Fire Service Policy and Code of Practice)
- designated fuel storage area
- fire-breaks (under the Mine Fire Service Policy and Code of Practice)
- grass cutting (under the Mine Fire Service Policy and Code of Practice)
- daily preparation plans
- annual fire training.[264]

An identified control for spontaneous combustion was covering waste coal in worked out batters, the mine floor and overburden dump in compliance with the Mine Fire Service Policy and Code of Practice.[265] However, as noted above, under s. 3.4 of the Mine Fire Service Policy and Code of Practice, there is only a requirement to cover coal in worked out batters if there are no tanker filling points or hydrant manifolds within five minutes travel.

Professor Cliff identified a number of critical shortcomings in the bow-tie diagram and system control descriptions developed in October 2012.

Professor Cliff told the Board that the documents do not identify fire in the worked out batters as a specific hazard.[266] In Professor Cliff's experience, mine fire risk assessments are 'location-specific' and 'scenario-specific'.[267] Based on prior incidents experienced at the Hazelwood mine, a fire in the worked out areas is a particular type of mine fire that needs to be managed and Professor Cliff told the Board he would have expected to see this treated as a separate hazard.

Professor Cliff also told the Board that the system controls identified do not address ember attack as a specific scenario that could cause a fire in the worked out areas of the mine. Professor Cliff found it surprising that 'there appears to have been no consideration of where these embers could lodge within the mine other than the active working areas…given the sheer surface area of the abandoned areas and the associated large expanse of coal.'[268]

Further, it is apparent from the GDF Suez bow-tie diagram that it does not include the kinds of impacts that Professor Cliff would have expected to see listed on the right hand side of the bow-tie diagram, such as multiple fatalities, injury, damage to plant, loss of asset, loss of production and harm to local the community.[269]

Professor Cliff advised that there did not appear to have been any consideration or testing of risk controls to determine whether such controls were effective under adverse conditions such as the inability of the CFA to respond during peak fire season, loss of power or failure of pipes and pumps.[270]

Mr Incoll also observed in relation to the Safety Assessment that:

> The framework for Occupational Health and Safety in relation to fire in the proximity of the Mine has been extensively developed… However the same audit process was not conducted into incursions by external fires, despite the history of rural fire affecting mining operations since at least 1944. Apart from seasonal break preparation and vegetation management, the framework for responding to the external fire threat only commences operation when a fire is a threat to the Mine, that is reactively rather than proactively by identifying and mitigating hazards outside the Mine boundary.[271]

Professor Cliff initially formed the view that the bow-tie diagram and system control descriptions developed in October 2012 did not satisfy the requirements under r. 5.3.23.[272] However, Professor Cliff did not have the 2003/2004 Safety Assessment and 2009 GHD report when preparing his expert report.[273] After being shown these documents, he conceded that they did provide the basis for a Safety Assessment that met the requirements of r. 5.3.23.[274]

However, Professor Cliff also maintained that the documents did not address the issue of fire in the worked out areas of the Hazelwood mine, 'because they only refer to multiple fatality under the major mining hazard feature.'[275]

RECOMMENDATIONS ARISING FROM REVIEWS OF PREVIOUS FIRES AT THE MINE

PAST FIRES AT THE HAZELWOOD MINE

As noted in Chapter 2.1 Origin and circumstances of the Hazelwood mine fire, open cut coal operations are high-risk environments for fire. Given the volatility of brown coal, it is not unusual that the Hazelwood mine experiences several fires in any given week.[276] Prior to privatisation, it appears there were between 200 and 400 fires a year.[277] The vast majority of fires experienced at the Hazelwood mine are minor fires that affect actively mined areas of the mine and are quickly suppressed without any requirement for CFA assistance.[278] These fires are generally caused by a mechanical fault of some sort, for example a bearing seizing in an idler resulting in sparks being generated, or a flare up of a pre-existing geological hot spot.[279]

In the early 1990s, there were around 10–20 fires a year in the worked out areas of the mine.[280] There was evidence that, at that time, the majority of fires in the worked out areas resulted from welding associated with the repair of leaking pipework.[281] The exact incidence of fires in the worked out areas in recent years was unable to be determined during the course of the Inquiry.[282]

To Mr Dugan's knowledge, none of the previous fires at the Hazelwood mine was caused by external bushfires. In Mr Dugan's 35 years' experience in the Latrobe Valley brown coal mining industry, he was not aware of any fire being caused in the Hazelwood mine as a result of external bushfire, prior to the Hazelwood mine fire in 2014.[283] While this might be true of the Hazelwood mine, the risk of bushfire resulting in a major fire in an open cut brown coal mine is well known and has occurred before in the Latrobe Valley. The Yallourn mine fire in 1944 was caused by an external bushfire and became the subject of the Stretton Royal Commission. Bushfire risk is also explicitly acknowledged in the GDF Suez Mine Fire Service Policy and Code of Practice.[284]

The Hazelwood mine also experienced a well-publicised fire in 1977 (recommendations arising out of which led to the creation of the initial 1981 Policy and Code, as discussed above).[285]

Since privatisation, there have been a number of significant fires, which are outlined in Figure 3.21 below.

Figure 3.21 Recent fire history at the Hazelwood mine

Date fire started	Cause of fire and brief description
12 February 2001	A fire occurred on the Energy Brix coal supply conveyor. The fire was most probably caused by a bearing failure on a return idler. CFA personnel brought the fire under control within approximately one hour of it being detected. No one was injured. An internal investigation into the incident subsequently identified that the mine's Management System did not detect the failure on the conveyor.[286]
15 November 2003	Spot fires spread to the main slot coal bunker. The cause of the first fire was not able to be determined. The most significant fire was controlled by approximately midnight. About 100 CFA and other personnel fought the fires. No one was injured. An internal investigation into the incident found that high temperatures and strong winds contributed to the spread of the fire.[287]
3 April 2005	A fire developed on conveyors M171 and M172 and spread to the main coal bunker. Both the CFA and the Metropolitan Fire Brigade provided assistance to fight the fire. No serious injuries were caused. The Mining Regulator directed the mine operator to conduct a risk assessment for combatting fires at height. An internal investigation was carried out and recommended a number of improvements in emergency response and firefighting.[288]
30 December 2005	A major fire established in the south-east field, which by that time was no longer being mined. Fire in an old geological hot spot spread as a result of hot temperatures and strong north-westerly winds. CFA crews from local brigades were not able to attend due to other fires in the area and CFA crews largely unfamiliar with mine fires attended the fire. The fire was 'controlled' by 1 January 2006 and was declared 'safe' by 5 January 2006.[289]
12 October 2006	An idler overheated and a mine conveyor unit caught fire. The fire caused extensive damage to the plant within the mine, valued at approximately $30 million. The fire was suppressed on 18 October 2006, and salvage works continued for several days following the fire.[290]

Date fire started	Cause of fire and brief description
14 September 2008	The fire started at approximately 12.45 pm, caused by an ignition from the same hot spot in the worked out areas that caused the December 2005 fire. Personnel were unable to mount an effective initial response to the fire due to difficult access to the worked out areas and insufficient firefighting facilities, and the fire spread. The CFA were not able to attend for two hours. The fire was controlled by 17 September 2008.[291]
21 January 2012	The D11 dredger caught fire as a result of faulty idler overheating and igniting coal and rubber on a conveyor. Fire did not appear to spread to the coal surface (which was 12 metres below the dredger), and was isolated to the machine itself. The fire flared and was difficult to contain because of a time delay in securing an external water supply to extinguish the fire. The fire was extinguished by 4 pm on 21 January 2012.[292]

INVESTIGATIONS AND REVIEWS INTO PAST FIRES

In respect of each of these incidents, either GDF Suez or independent consultants who GDF Suez retained, carried out an investigation and produced an incident report with a series of recommendations. The relevant regulator at the time became aware of all of these incidents and took a varying level of interest, depending on the nature and particular features of the fire and its approach to regulation (see Chapter 3.2 Regulation of fire risk at the Hazelwood mine for more detail).

All of these previous incidents form part of the history of fires at the Hazelwood mine and lessons can be learnt from them. The December 2005 and September 2008 fires were of particular interest to the Board, as they concerned fires that took hold in worked out areas of the mine. Although considerably smaller in scale and caused by hot spots, rather than bushfire, there were a number of similarities between these fires and the Hazelwood mine fire in 2014.

Notably, the internal investigation into the December 2005 fire found that:

- The fire broke out between levels 3 and 5 on a coal face which was 30 metres high and difficult to reach.[293]
- The mine's tanker was unable to quickly respond to the initial outbreak of fire, as it was being used to combat a grass fire elsewhere in the mine. By the time the tanker was en route, it became apparent that CFA assistance would be required.[294]
- There were limited personnel available due to the holiday period so employees on leave were called upon to form fire and relief crews.[295]
- CFA crews from the Latrobe Valley who were familiar with coal mine fires could not attend due to ongoing fires in the region (Region 10). CFA crews from Region 8 Western district were called. These crews, although competent at fighting bushfires, appeared unsure and hesitant on how to attack a coal fire.[296]
- Although water supply was reliable within the designated fire area (in the south-east batters), 'further consideration should be given to ease of access, location and reliability of water supply in other worked out sections of the mine, specifically the north-eastern batters of the mine.'[297]
- 'Where ever [sic] practically possible fire-break zones extending down the full depth of each batter may be utilised such that the length of exposed coal in any one batter is not greater than 500 m. These zones can be in the form of metalled vehicle access ramps or clay covering a minimum or 8 m wide.'[298] This recommendation reflected the alternative fire measure already specified in s. 3.4 of the Mine Fire Service Policy and Code of Practice.

The September 2008 fire was caused by the same hot spot as the December 2005 fire. Following the 2005 fire, the hot spot was covered in clay and monitored, but spots such as this can flare up unexpectedly, for example due to wind getting through cracks in the coal.[299]

GDF Suez engaged GHD to investigate the September 2008 incident. The GHD report into the 2008 fire noted that:

- It is essential that GDF Suez is 'able to mount a decisive initial response to prevent small fires escalating into large fires. This is particularly important out of normal work hours when manning levels are very low. It takes CFA up to two hours to mobe [sic] a full response of sufficient resources to combat significant fire' at the Hazelwood mine.[300]
- 'The significant factor in this fire was the escalation into an uncontrollable fire within a short time due to [mine] personnel being unable to mount an effective initial response as the non-operational areas have very difficult access and there were insufficient fire-fighting facilities available.'[301]
- At some stage prior to the incident, 'the fire water pipe that supplied this non-operational section of the mine had been damaged and the fire water isolated.'[302]

The Board was particularly interested in recommendation 6 of the GHD report into the September 2008 fire in the worked out areas of the Hazelwood mine:

> **A risk assessment should be undertaken on the non-operational areas to determine if further prevention work is required. The risk assessment should include a Cost/Benefit Analysis.**
>
> A range of options have been identified in terms of prevention of hot spots from reigniting and detection of hotspots.[303]

The draft version of this recommendation read as follows:

> **A risk assessment should be undertaken on the non-operational areas to determine if further prevention work is required. The risk assessment should include a Cost/Benefit Analysis.**
>
> A critical element of the initial response and the ongoing emergency response was the lack of fire water supply to the non-operational areas and the restrictions in access due to the conditions of the roads, the accumulation of debris and that some batters did not have road access.
>
> The annual audit should include fire water supply to non-operational areas, access and housekeeping.
>
> A range of options were identified in the brainstorming session (refer Appendix B) in terms of prevention of hot spots from reigniting and detection of hotspots.[304]

GDF Suez has revisited recommendations arising from previous significant fires on a number of occasions. GDF Suez also maintains a software system known as Paradigm II to manage compliance and allow employees to track the implementation of actions arising from incidents at the Hazelwood mine.[305]

The report into the October 2006 fire included a review of the recommendations arising out of the 1977 fire at the Hazelwood mine.[306] The report into the September 2008 fire also reviewed the implementation of recommendations arising out of the October 2006 fire and found that all of those recommendations had been implemented.[307] The Mining Regulator oversaw implementation of these recommendations, including a review of the Mine Fire Service Policy and Code of Practice.[308]

The recommendations arising out of the January 2012 fire have also been fully implemented.[309]

GDF Suez submitted that its implementation of recommendations arising from reviews of previous incidents has led to improvements in its fire management procedures.[310] GDF Suez provided the following examples of such improvements:

- training exercises with the local CFA
- refined techniques for fighting coal fires (eg the use of a 30,000 litre water tanker as the first responder to any fire emergency)
- the implementation of procedures under which Mine personnel escort the CFA throughout the mine

- updating the following fire policy documents:
  - Mine Fire Service Policy and Code of Practice
  - Emergency Response Plan
  - Mine Fire Instructions
- the preparation of the following additional fire policy documents:
  - Guidelines for Season and Period Specific Fire Preparedness and Mitigation Planning
  - Guidelines for Season Specific Fire Preparedness and Mitigation Planning
  - Check List For Fire Fighting Equipment Annual Audit and Inspection
  - Check List For Season Specific Fire Preparedness and Mitigation Planning.[311]

In June 2012, Mr Stan Kemsley, GDF Suez Mine Technical Compliance Manager, conducted an audit of the implementation of recommendations from the fires in April 2005, October 2006, September 2008 and January 2012. Mr Kemsley's report (dated 29 June 2012) includes a table, which lists the recommendations from each incident and states whether they have been addressed and whether they have, in Mr Kemsley's view, been effective.[312]

The implementation of recommendations arising from the review of the December 2005 fire in the worked out areas of the Hazelwood mine was not included as part of Mr Kemsley's audit. However, it is clear that the recommendation in the relevant incident report concerning the formation of clay fire-breaks[313] was not implemented.[314] The reason for not doing so is clear from the evidence of Mr Polmear and Mr Faithful referred to in detail above—it was not practicable in areas where the profile of batters in worked out areas is extremely steep.

Critically, Mr Kemsley found that recommendation 6 of the September 2008 report had not been implemented.[315]

Mr Romeo Prezioso, GDF Suez Senior Mine Planner, was the Fire Service Officer at the time of the September 2008 fire and listed a range of measures that GDF Suez had implemented in response to recommendation 6. These included:

- From about February 2009 to April 2013, the production of a Monthly Hotspot Inspection Report with respect to the known hotspots (as identified by Mr Prezioso).
- From about December 2012, inclusion of the results of regular Fire Hot Spot Status reports as part of the Fire Management Systems - Weekly Status "Rag Reports".
- The removal of disused mining infrastructure, such as a conveyor and ARMCO vehicle crossing from the southern batters of the Hazelwood mine, and the realignment of a road, in order to improve access.
- The enhancement of the annual firefighting equipment audit to more comprehensively address the worked out areas of the Hazelwood mine. The annual audit now assesses access conditions and the condition of the fire services infrastructure at the worked out areas of the Hazelwood mine.
- The digging out and recapping of known hot spots with clay.
- The use of thermal imaging cameras, and consideration of the use of buried thermocouples.[316]

The audits of fire services infrastructure referred to by Mr Prezioso were said to include the reticulated fire service pipes in the area and resulted in various improvements being made to the water supply, including the repair or installation of new pipes, valves, sprays and other mechanisms.[317] However, Mr Prezioso said that the purpose of the audit was not to evaluate the effectiveness of the existing fire service network, but 'to assess [that] what was on site was operational and functional.'[318] As a result, no additional pipework was installed in the northern batters in response to the September 2008 fire or the audits of the fire service network that followed.[319]

Mr Prezioso also conceded that no risk assessment had been conducted as recommended.[320]

Mr Prezioso explained that he understood the key concerns behind recommendation 6 were:

- improving access to worked out batters such as the southern batter
- ensuring early detection of 'flare ups' of hot spots within the Hazelwood mine.[321]

Mr Prezioso was inviting the Board to conclude that GDF Suez had implemented the spirit of the recommendation, if not the letter.

DISCUSSION AND CONCLUSIONS

COMPLIANCE WITH THE REQUIREMENTS OF THE MINE LICENSING REGIME

On the evidence before the Board, GDF Suez is currently compliant with its obligations under the Mineral Resources Act and related regulations, as well as the conditions specified in its current mining licence, approved work plan and approved rehabilitation plan.

The Board was unable to establish that the approval of a work plan variation was required before pipework forming part of the fire service network in the northern batters of the Hazelwood mine was removed. However, the failure to replace this pipework is worthy of criticism for a number of other reasons, which are discussed in further detail below.

GDF Suez is generally compliant with its fire management policies and other policies and standards referred to in its approved work plan, subject to some qualifications.

The minimum requirement for fire protection in the worked out batters set out in the Mine Fire Service Policy and Code of Practice is to provide tanker filling points or hydrant manifolds within five minutes travel. This measure is much more directed to suppression rather than prevention of a fire.

The Board is concerned that GDF Suez considered it sufficient to implement fire protection measures that only met the minimum requirement. There is conflicting evidence whether GDF Suez met this minimum requirement.

COMPLIANCE WITH THE WORK PLAN

A condition of the mining licence for the Hazelwood mine is that work is carried out in accordance with the approved work plan (incorporating a rehabilitation plan) as amended from time to time under the Mineral Resources Act.[322] In the Mining Regulator's view, GDF Suez has not breached any provision of the Mineral Resources Act,[323] and by extension has carried out work in accordance with the approved work plan and rehabilitation plan. On the evidence before it, the Board cannot conclude otherwise.

However, the Board notes that one of the requirements of the 1996 work plan was that the mine licensee adhere to the 1994 Policy and Code.[324] It is also a requirement of the 2009 work plan variation that GDF Suez conduct its operations in general compliance with the 1994 Policy and Code.[325] GDF Suez did not provide evidence of its compliance with the policy. This is explored in detail below under the heading 'Compliance with Mine Fire Service Policy and Code of Practice.'

Section 9.1 of the 2009 work plan variation also states that as part of its health and safety management plan GDF Suez is compliant with AS4801.[326] There is evidence before the Board that GDF Suez had not conducted a risk assessment in respect of the worked out areas of the Hazelwood mine as would be expected of an organisation that had fully implemented the standard (see below 'Compliance with the requirements of the OHS regime').

The work plan also referred to there being an extensive network of water reticulation pipework and sprays for fire protection, which was illustrated in Figure 13A to the 1996 work plan (see Figure 3.5). Based on the submissions made by GDF Suez[327] and the view expressed by Ms White during the public hearings,[328] the Board is satisfied that the removal of pipework from the northern batters between 1994 and 2007 did not constitute a breach of the approved work plan. However, the Board expresses a number of other concerns arising out of the removal of pipework, which are discussed in further detail below.

COMPLIANCE WITH THE MINE FIRE SERVICE POLICY AND CODE OF PRACTICE

GDF Suez submits that it was compliant with the Mine Fire Service Policy and Code of Practice in relation to fire protection in the northern batters of the Hazelwood mine.[329]

In respect of worked out areas of the Hazelwood mine, the minimum requirements under both the 1994 Policy and Code and the current Mine Fire Service Policy and Code of Practice are:

- tanker filling points or hydrant manifolds are to be provided within five minutes travel of any part of the worked out areas
- fixed sprays should be used in conjunction with droppers for the tanker filling points in order to provide wetted breaks
- the use of fire-break zones in the form of access ramps or clay covering is provided as an alternative, rather than the primary means of prevention.[330]

The use of fire-break zones was not practicable in many parts of the worked out areas due to the steep batter profile[331] and was not implemented throughout the northern batters.[332] Fixed spray coverage did not extend to large sections of the northern batters where pipework was removed in the period 1994 to 2007.[333] So, for many parts of the worked out areas of the Hazelwood mine, the only preventive measure under the Mine Fire Service Policy and Code of Practice adopted by GDF Suez was to have tanker filling points or hydrant manifolds within five minutes travel of any part of the worked out areas.

Counsel Assisting submitted that on the evidence before the Board it was unclear whether even this minimum requirement had been met.[334] The Victorian Government also made this submission.[335]

Mr Polmear believed that GDF Suez was compliant with the policy and assumed some testing had been conducted to ensure tanker filler points were located within five minutes of otherwise unprotected worked out batters.[336] However, both Mr Polmear and Mr Dugan were unable to say whether any such testing had actually taken place[337] and GDF Suez provided no other evidence that it had. This was despite a request from the Board on 9 May 2014 that a witness give evidence relating to GDF Suez's state of compliance with its fire mitigation and response plans and policies as at 9 February 2014.[338]

The Board notes that the Mine Fire Service Policy and Code of Practice also requires that the design and location of tanker filling points should involve consideration of 'ease of access, location and reliability of the water supply.'[339]

According to Mr Faithful, during the Hazelwood mine fire, tankers were able to refill from tanker filling points throughout the site and there was a mains fresh water refill point on the northern batters.[340] However, Mr Anthony Lalor, CFA Volunteer, described difficulties associated with locating tanker filling points, hydrants having threads incompatible with CFA hoses, and very long refill times.[341] Furthermore, Mr Dugan conceded that it would require some degree of familiarity with the mine to know where the tanker filling points are.[342]

On the information before it, the Board is unable to determine whether GDF Suez was compliant with the Mine Fire Service Policy and Code of Practice.

The adequacy of existing fire management policies are discussed in further detail under the heading 'Adequacy of fire prevention measures at the Hazelwood mine'.

COMPLIANCE WITH REHABILITATION PLAN

The Board accepts the position of the Mining Regulator and GDF Suez that rehabilitation obligations under the current approved work plan and rehabilitation plan are being met.[343]

In reality, this is not difficult to achieve because under the 2009 work plan, the first progressive rehabilitation milestone will not be triggered until 2019.[344] For the purposes of this Inquiry, the difference in interpretation regarding whether this first stage must be commenced or completed by 2019 is immaterial. On either view, the requirement to commence or complete the first stage of progressive rehabilitation has not yet been triggered and suitable overburden will not become available under the present progressive rehabilitation plan until 2016 at the earliest. There is still time for GDF Suez to meet this requirement.

COMPLIANCE WITH THE REQUIREMENTS OF THE OHS REGIME

SAFETY MANAGEMENT SYSTEM (R. 5.3.21 OF THE OHS REGULATIONS)

As a consequence of GDF Suez's late provision of its SMS to the Board, no witness was able to give evidence as to whether or not it satisfied the requirements under r. 5.3.21 of the OHS Regulations. Accordingly, the Board is not in a position to conclude whether there has been any breach of this regulation.

However, the Board notes that r. 5.3.21 is not limited to 'major mining hazards'. Regulation 5.3.21(3)(f) specifically requires that a SMS set out 'the systems, procedures and other risk control measures by means of which risks to health or safety associated with mining hazards are to be controlled' (emphasis added). Mr Neist confirmed that while Safety Assessments under r. 5.3.23 address 'major mining hazards', a SMS must address all mining hazards.[345] Professor Cliff also identified this distinction.

The GDF Suez SMS also refers to its compliance with AS4801, which requires that all hazards and associated risks are identified and assessed.

As noted above, the GDF Suez SMS only appears to provide a system for the identification, risk assessment and risk control measures of major mining hazards.[346]

Mr Neist considered that the SMS demonstrated GDF Suez had engaged in a risk assessment in relation to fire in the worked out areas of the Hazelwood mine.[347] Mr Neist said:

> In looking at their Safety Management System in understanding what they consider to be a mining hazard, fire in the mine no matter where it is in the mine is a mining hazard and they're required to address all mining hazards in their safety management system… If a fire is a mining hazard and is then considered in the safety management system, the controls in relation to fire, not as a major mining hazard but just as a mining hazard, is covered in the safety management system, so therefore they've put their mind to that risk assessment.[348]

In the Board's opinion, this observation is not supported by the GDF Suez SMS or other documents provided to the Board. As identified above, there is no requirement under s. 3 of the SMS to engage in any risk assessment of hazards other than major mining hazards identified. Document 4 of the GDF Suez SMS is a hazard and risk register, which purports to address all mining hazards, not just major mining hazards. It makes reference to major and minor fires but only in the operational parts of the Hazelwood mine. It makes no reference to the hazard of fires in the worked out areas of the mine, nor does it refer in any part to the possible consequence of harm to people outside the mine.

SAFETY ASSESSMENT (R. 5.3.23 OF THE OHS REGULATIONS)

In light of the evidence of Mr Neist, Mr Hayes and Professor Cliff, GDF Suez appears to have conducted a Safety Assessment in accordance with r. 5.3.23 of the OHS Regulations.

While a number of concerns were raised about the scope of the Safety Assessment, r. 5.3.23 only requires an assessment in respect of major mining hazards, which the Safety Assessment carried out by GDF Suez satisfied.

However, the Board's understanding of the adequacy of the Safety Assessment was made difficult by the fact that it was not embodied in a single document, or a coherent suite of documents that could be readily referred to. Further, GDF Suez did not provide a witness who gave a cogent explanation of how the Safety Assessment fit within GDF Suez's OHS compliance policies.

Further, as conceded by Mr Neist,[349] the requirements of r. 5.3.23 are procedural and the substantive obligation under ss. 21 and 23 of the OHS Act is still to eliminate or reduce risks to health and safety so far as is reasonably practicable (see Chapter 3.2 Regulation of fire risk at the Hazelwood mine).

For the purposes of fulfilling those statutory obligations, GDF Suez is also required to:

- so far as is reasonably practicable, identify all mining hazards at the Hazelwood mine and assess the associated risks to health and safety (r. 5.3.7 of the OHS Regulations)
- adopt risk control measures that eliminate or reduce those risks so far as is reasonably practicable (r. 5.3.8)
- review and, if necessary, revise these matters after any incident involving a mining hazard occurs, or at least once every three years (r. 5.3.9).

FAILURE TO IDENTIFY ALL MINING HAZARDS AND ASSESS RISKS TO HEALTH AND SAFETY (R. 5.3.7 OF THE OHS REGULATIONS)

Based on the evidence before it, the Board considers that GDF Suez did not adequately recognise a fire caused by ember attack on the worked out areas of the Hazelwood mine as a mining hazard. GDF Suez failed to identify potential risks to the health and safety of firefighters and the residents of neighbouring communities as a consequence of such a fire.[350] All of these factors were foreseeable, if not foreseen.[351]

The Board is not satisfied that GDF Suez has complied with r. 5.3.7 of the OHS Regulations.

GDF Suez sought to categorise the Hazelwood mine fire as a 'perfect storm of events':

> What was also not readily foreseeable is the prospect of two fires approaching the mine simultaneously, one or more possibly the work of arsonists, and in combination the power supply failing. It is this perfect storm of events, which we submit were not readily foreseeable.[352]

The Victorian Government submitted that '[t]he risk of offsite impacts of the kind experienced by the Morwell community from a large, sustained fire in worked out batters was not foreseeable and accordingly not anticipated or prepared for.'[353]

However, the Board notes that:

- There had been numerous fires in the worked out areas of the Hazelwood mine, including two recent significant fires in December 2005 and September 2008.
- The risk of bushfire entering the Hazelwood mine was well recognised,[354] and had occurred before in the 1944 Yallourn mine fire.
- It is well known that exposed brown coal is highly combustible, that is why it is mined.[355]
- It is well known that brown coal mine fires are extremely difficult to extinguish once they spread, particularly where there are access issues or lack of water.[356]
- A 1992 risk analysis and report warned that departure from the requirements of the 1984 Policy and Code (something which subsequently occurred) would increase fire risk in the worked out areas of the Hazelwood mine.[357]
- Prior to the Hazelwood mine fire, the 'nuisance' of smoke and ash and 'other community effects' had both been publicly and formally recognised as potential consequences of a brown coal mine fire at the Hazelwood mine.[358]
- The northern batters of the Hazelwood mine are within a few hundred metres of the Morwell community, and any fire in this location could have environmental and health impacts.
- GDF Suez recognised the threat of ember attacks,[359] but did not connect ember attack with the potential hazard it created in worked out areas of the Hazelwood mine that were otherwise unprotected.
- GDF Suez was previously aware of the risks associated with fire spotting from timber plantations in close proximity to the Hazelwood mine.[360]
- A proper risk assessment, particularly one conducted in accordance with the standards set by AS4801, would take into account adverse conditions such as loss of power, water supply, extreme weather conditions or CFA resources being diverted to other emergencies.[361]

These factors, and GDF Suez's awareness of a number of them, only heightened the need to identify the hazard of fire in the worked out areas of the Hazelwood mine.

The failure to identify risks associated with a fire in the worked out areas of the Hazelwood mine is brought into sharper focus by the fact that a specific recommendation was made to GDF Suez to undertake such a risk assessment following the September 2008 fire (discussed in further detail below).

The Board accepts Counsel Assisting's submission that the Hazelwood mine fire was an entirely foreseeable event and one that should have been planned for.[362]

Moreover, the conditions leading up to the Hazelwood mine fire did not represent the worst-case scenario. The consequences of the fire could have been much more severe. Mr Incoll told the Board that there were two circumstances that meant a worst-case scenario was avoided:

- The weather conditions on the day could have been much more extreme with lower humidity levels. The relative humidity at the time of the wind change was 11 per cent. When the wind change came through, the humidity rose to 32 per cent. This meant that the moisture content of potential fire fuel was relatively high and therefore the risk of extreme fire behaviour was lower than it might have otherwise been. By contrast, below five per cent humidity was encountered during the Black Saturday fires.
- Had the wind not tended to change direction at the time when it did on 9 February 2014, then the Hernes Oak fire may have been propelled directly into the mine and 'there's nothing that anyone could have done to have stopped it because of the fire intensity levels.'[363]

According to Mr Incoll, low humidity and wind propelling fire in to the mine is the worst-case scenario that must be prepared for.[364]

The only evidence relied upon by GDF Suez in support of the contention that it had in fact undertaken a risk assessment in respect of fire in the worked out areas of the Hazelwood mine was the evidence of Mr Neist.[365] While the views of the regulatory agency actually responsible for enforcement of the OHS Regulations must not be disregarded, Mr Neist's opinion was not supported by the documentation upon which he expressed his opinion to be based, nor did it have any other factual basis.

During oral submissions, GDF Suez also referred the Board to the fact that Mr Hayes had never formed a view that he had the need to issue an improvement notice in respect of a breach of r. 5.3.7 of the OHS Regulations.[366] Mr Hayes' evidence must be understood in the context of VWA's regulatory focus on major mining hazards.[367] Regulation 5.3.7 is not limited to major mining hazards. It is also relevant that the principle underlying the regulatory framework is that the primary obligation to manage risk at a site rests with the duty holder, not the regulator.[368]

FAILURE TO ADOPT RISK CONTROL MEASURES (R. 5.3.8 OF THE OHS REGULATIONS)

Under r. 5.3.8(1) of the OHS Regulations, the operator of a mine must also adopt risk control measures that reduce or eliminate risks to health or safety so far as is reasonably practicable.

As a preliminary matter, GDF Suez submitted that it was not put to any witness of GDF Suez that it had contravened r. 5.3.8 either by reason of its approach to rehabilitation or on any other basis.[369] However, a considerable focus of the Inquiry, and the evidence of Mr Faithful and Mr Polmear in particular, was the adequacy of fire management policies at the Hazelwood mine, and matters relating to the reasonable practicability of various fire prevention measures that were aimed at controlling and reducing risks to health or safety.

The risk controls adopted by GDF Suez in respect of the worked out areas of the Hazelwood mine were ineffective at preventing the Hazelwood mine fire or mitigating its severity. The adequacy of these measures is explored in detail below under the heading 'Adequacy of fire prevention measures at the Hazelwood mine'. The adequacy of risk control measures directed to preparedness to respond to a fire is examined in Chapter 2.2 Preparing for fire.

The critical issue in terms of r. 5.3.8 is whether risk control measures potentially available to GDF Suez to eliminate or reduce the health and safety risks associated with a fire in the worked out areas of the Hazelwood mine were 'reasonably practicable.'

As noted in Chapter 3.2 Regulation of fire risk at the Hazelwood mine, determining whether particular preventive measures are reasonably practicable involves an assessment of a number of factors:

- the likelihood of the hazard or risk concerned eventuating
- the degree of harm that would result if the hazard or risk eventuated
- what the person concerned knows, or ought reasonably to know, about the hazard or risk and any ways of eliminating or reducing the hazard or risk
- the availability and suitability of ways to eliminate or reduce the hazard or risk
- the cost of eliminating or reducing the hazard or risk.[370]

Assessing the cost of a control measure involves a consideration of both the cost of implementing a particular control to eliminate or reduce the risk and the cost of not implementing it. In the context of the Hazelwood mine fire, this means that one must have regard not only to the cost of implementing measures that might have eliminated or reduced the risk of fire in the worked out areas of the Hazelwood mine, but also to the cost of not implementing those measures, such as loss of production, and other costs incurred by GDF Suez in fighting the fire.[371]

There was evidence before the Board that these costs were substantial.

Mr Graham estimated the total cost incurred by GDF Suez as a result of the Hazelwood mine fire as in the 'tens of millions.' The cost of installing pipework in the northern batters during the Hazelwood mine fire alone was $2.5 million.[372]

In addition, the cost borne by the Victorian Government for fire suppression activities alone was approximately $32.5 million, not taking into account the value of volunteer labour and costs incurred directly by the community.[373] This sum does not take into account costs incurred by the Environment Protection Authority, Department of Health, Department of Human Services, Department of Education and Early Childhood Department or Latrobe City Council. The CFA may seek to recover some of its firefighting costs from GDF Suez.[374] The Board estimates the total cost borne by the Victorian Government, local community and GDF Suez exceeds $100 million.

The adequacy of measures adopted by GDF Suez must be considered against this background.

There was evidence before the Board of a number of potentially effective methods for preventing fire in the worked out areas of the Hazelwood mine, in particular wetting down exposed coal on days of high fire danger, rehabilitating the land, and capping exposed coal with clay or some other fire retardant substance. Some of these measures have been utilised to varying degree in parts of the Hazelwood mine. However, each option has advantages and disadvantages, including cost, suitability, complexity and difficulties with timely implementation. Without the benefit of a proper risk assessment, it is not open for the Board to say conclusively whether any of these options was a reasonably practicable control measure available to GDF Suez prior to the Hazelwood mine fire, subject to three exceptions.

First, unlike operational areas of the Hazelwood mine, there was no requirement to institute wetting down of exposed coal in worked out areas of the mine on high fire alert days. Mr Graham's evidence was that this requirement could be implemented immediately and the cost was not anticipated to be significant.[375]

Second, GDF Suez failed to replace degraded and leaking pipework that was removed between 1994 and 2007. The only reason provided for failing to do so was that 'they didn't need to be, in accordance with the policy.'[376] As observed by Professor Cliff, 'there's no science behind that, there's no risk evaluation analysis behind that. To say we don't do it because we don't have to is not a management technique.'[377] While the $2.5 million cost of installing such pipework was substantial, it is obvious that undertaking this project would have been far less costly and risky if it had been done prior to and not during a major fire.

GDF Suez suggested that the effectiveness of fixed sprays in the worked out areas was necessarily constrained by water supply limitations. However, in the past when fixed sprays were used for prevention, rather than suppression, water supply was managed by sequential wetting down of coal faces area by area.[378]

Third, unlike the fire-break zone outside the perimeter of the Hazelwood mine, there is no existing requirement concerning vegetation management in the worked out areas within the mine.[379] According to Mr Graham, the cost of removing vegetation was unknown but vegetation could be cleared from the north-eastern batters before November 2014.[380]

REVIEW AND REVISION FOLLOWING PREVIOUS INCIDENTS INVOLVING MINING HAZARDS (R. 5.3.9 OF THE OHS REGULATIONS)

Regulation 5.3.9 of the OHS Regulations requires the operator of a mine to review and, if necessary, revise (at least every three years, as well as after any incident involving a mining hazard that occurs at the mine):

- the identification of mining hazards
- the assessment of risks to health or safety associated with mining hazards
- the risk control measures adopted.

The evidence shows that GDF Suez was engaged in a process of ongoing review of risks associated with mine fires and continual improvement of its policies and procedures. Following the September 2008 fire, it is also clear that GDF Suez:

- engaged independent consultants to conduct an investigation into the incident[381]
- introduced a number of measures to improve identification and management of hot spots in worked out areas of the Hazelwood mine[382]
- conducted an audit in June 2012 to determine whether recommendations arising from this incident had been implemented.[383]

As discussed under the heading 'Implementation of recommendations from previous incidents' below, GDF Suez did not undertake an assessment of the risk of fire in the worked out areas of the Hazelwood mine, as recommended following the September 2008 fire.

However, r. 5.3.9 does not require the implementation of every recommendation arising out of an incident. It only requires a revision of existing risk management 'if necessary'. While the decision not to undertake a risk assessment can be criticised on other grounds, it does not give rise to a breach of r. 5.3.9.

IMPLEMENTATION OF RECOMMENDATIONS FROM PREVIOUS INCIDENTS

The Board accepts that GDF Suez's implementation of recommendations arising from previous incidents has led to improvements in its fire management procedures.[384]

However, it is clear that it failed to conduct a risk assessment into the risk of fire in the worked out areas of the Hazelwood mine in accordance with recommendation 6 of the report into the September 2008 fire.

The Board considers Mr Prezioso's interpretation of the scope of recommendation 6 to be unduly narrow. Based on his 29 June 2012 report, Mr Kemsley did not understand recommendation 6 to be limited to risks associated with hot spots and he found that the recommendation had not been complied with.[385] In light of the unambiguous wording of recommendation 6 and Mr Kemsley's 2012 report, the Board concludes that GDF Suez understood this recommendation to be broader than that contended by Mr Prezioso.

GDF Suez submitted that:

> [t]he various fire reports have been internal reports prepared for the benefit of [GDF Suez] and its predecessor entities. There is no regulatory or statutory requirement to implement all of the recommendations within such reports. There have also been no separate recommendations or directions from any regulator, body or agency arising out of any of the fires referred to above.[386]

The Board accepts that GDF Suez has complied with all directions and recommendations from regulatory agencies regarding previous fires at the Hazelwood mine. However, it remains the case that the primary obligation to manage risk at a site rests with the duty holder, not the regulator.[387]

Although there is no regulatory or statutory requirement to implement all of the recommendations arising from prior incidents, in reality recommendation 6 of the GHD report into the September 2008 fire only urged GDF Suez to do what it was already required to do under the OHS Regulations. Specifically, GDF Suez was required to:

- identify all mining hazards at the mine and assess the risks to health or safety associated with all mining hazards at the mine—a task GDF Suez had not undertaken explicitly in respect of the worked out areas of the Hazelwood mine (r. 5.3.7 of the OHS Regulations).
- adopt risk control measures to eliminate or reduce risks to health and safety so far as is reasonably practicable (r. 5.3.8). A proper risk assessment into the 'non-operational areas' would have involved testing existing controls directed to the worked out batters, identifying further preventive measures and evaluating the extent to which those measures were reasonably practicable.
- after any incident involving a mining hazard occurring at the Hazelwood mine, review and, if necessary, revise the identification of mining hazards, the assessment of risks to health or safety and the risk control measures adopted (r. 5.3.9).

The Board must also specifically address, as part of its Terms of Reference, whether GDF Suez implemented the recommendations arising from reviews of previous events. In respect of recommendation 6 of the GHD report into the September 2008 fire, it is clear that it had not.

According to GDF Suez:

> [w]hilst no formal risk assessment report was produced in relation to Recommendation 6, no evidence has been adduced to the Inquiry (including by the experts retained by the Board) as to what the result of any such risk assessment may have been, and whether it would have resulted in steps being taken by the Mine which went beyond the steps described by Mr Prezioso. This is particularly the case given that Recommendation 6 made it plain that any risk assessment should include a cost/benefit analysis. As the evidence of Leonard Neist makes plain, the cost of possible steps might significantly outweigh the benefit, which in the context of the 2008 report, was fire from the flare up of a pre-existing hot-spot[388]

The Board considers this answer unsatisfactory. It is precisely through the risk assessment process that one is forced to test existing control measures, consider further potential control measures and evaluate their reasonable practicability or otherwise. That GDF Suez failed to undertake the recommended risk assessment meant that an opportunity was lost to implement measures that might have prevented or mitigated the severity of the Hazelwood mine fire. It is salient that GDF Suez is now committed (after the mine fire) to undertaking an assessment of the risk of fires in the worked out areas of the Hazelwood mine.[389]

Based on the outcomes of the 1992 risk analysis and the range of preventive measures canvassed during the Inquiry, the Board considers that a thorough risk assessment was likely to have concluded that existing control measures were inadequate and could be improved in a number of ways.

SECTIONS 21 AND 23 OF THE OHS ACT

If there has been a failure to identify hazards, assess risks and implement risk control measures under rr. 5.3.7 and 5.3.8 of the OHS Regulations, it necessarily follows that there might also be a breach of ss. 21 or 23 of the OHS Act.[390]

VWA is conducting an investigation into the Hazelwood mine fire, the scope of which is unclear.[391] While the Victorian Government has not confirmed if these investigations include enquiries into whether there has been a breach of s. 23 of the OHS Act,[392] this is a matter that VWA would be entitled to look into.

CORPORATE CULTURE

Mr Graham gave valuable evidence to the Board regarding the lessons GDF Suez had learnt from the Hazelwood mine fire and the steps it had already committed to undertaking in response.

Mr Graham assured the Board that GDF Suez had embraced a solid enterprise risk management framework throughout various levels of the organisation and was committed to continual improvement through the regular use of risk assessments. The corporate culture of GDF Suez was described as one of 'safety first':

> The pillars, I guess, of a successful organisation are the staff, so protection of the staff is the most important, so one of the main pillars is the health and safety, and actually that's one of the things that we're very proud of.
>
> In terms of the incident, for an incident of this length of time, spanning the 45 days with an enormous amount of staff involved in the process, for us to have sustained one medical treatment injury which was actually in the first day of it with a sprinkler hitting one of our employees in the face, and I think four or five first aid treatments, I think it's testimony to the processes and procedures that we have in place there. I think we've actually demonstrated that we have a strong safety culture there, and whilst we are not actually discussing it now, if you were to actually look at statistically the performance in terms of all injury frequency rate for Hazelwood over the last 10 years, there's been a continual downward trend in terms of injuries to our employees, so we do take that very seriously.[393]

The Board does not dispute this observation and recognises GDF Suez's commitment to the health and safety of its employees. However, prior to the Hazelwood mine fire, this attitude did not extend to risks and hazards beyond the narrower range of risks in the 'operational areas' of the mine that were likely to affect employees or coal production.

In the Board's opinion, where risks concerned fire in the worked out batters and the associated risks to the health and safety of the neighbouring Morwell community, the risk management culture adopted by GDF Suez has been one of 'minimum compliance' rather than one of 'best practice continuous improvement'.[394] This 'minimum compliance' attitude was exemplified by GDF Suez's justification for failing to replace pipework in the northern batters and failing to conduct a risk assessment for the worked out areas of the Hazelwood mine following the September 2008 fire. It was also evident in the response to the various fire prevention measures proposed during the public hearings of the Inquiry.

The Board is of the opinion that this conduct fell short of the approach to be expected from an AS4801 compliant multinational organisation and GDF Suez's aspiration expressed in its own SMS to take 'a proactive approach to Health and Safety requirements at all levels of the business and in all decision-making processes.'[395]

Mr Graham acknowledged these failings. When asked whether the risk of fire in the worked out batters of the mine was adequately recognised by GDF Suez, Mr Graham said:

> You know, hindsight's a great thing. In terms of when you actually look at the major mining hazards, which is the area that that would have been covered by, because the major mining hazard is associated with the loss of one life or more, and the fact that our enterprise risk management system looks at costs to the business in terms of fire, what we have in that area identified as a risk from fire to do with call systems, if you like, is not indeed the operating faces on the mine even; I realise your question was on the worked out places, it's not even the operating faces of the mine, it's actually what we call the slot bunker which is the central point from the coil [sic] delivery from the mine into the power plant; the reason being, a fire there will put us out of business.
>
> So, in terms of our hierarchy of risk in terms of impact on the business, then a fire in the worked out batters does not fit in that category, and in terms of business risk, obviously we've had a huge event which is deeply regrettable and we will ensure we won't have another event like that again.
>
> We lost production for - well, we didn't lose total production, we came down to probably 10 per cent production for probably 24 hours. So, in terms of how our business would look at that risk in the hierarchy that was there, an event of fire in the worked out batters of the mine doesn't fit in a high profile. Following the events we've had now, the question is, should it? And the answer is, yes, it should, and it will, and that's part of the reason why we're making these suggestions.[396]

Mr Graham appeared to embrace a future best practice continuous improvement approach for the whole mine, including worked out areas, rather than taking a minimum compliance approach.[397]

The Board encourages GDF Suez to continue to strive for a sophisticated corporate culture in respect of the management of all risks.

ADEQUACY OF FIRE PREVENTION MEASURES AT THE HAZELWOOD MINE

ADEQUACY OF MINE FIRE SERVICE POLICY AND CODE OF PRACTICE

The Board accepts Mr Incoll's evidence that the maintenance of fire-breaks around the perimeter of the Hazelwood mine is not effective to protect exposed coal against a mass ember attack. What was needed was either covering exposed coal with soil or some form of fire retardant or water to wet down the worked out areas on days of high fire danger.

The removal of part of the fire service network from the northern batters meant that large areas of coal were not covered by either earth or water and were completely exposed. So long as these areas were within five minutes travel from a tanker filling point or hydrant manifold, GDF Suez continued to meet the minimum requirements under the Mine Fire Service Policy and Code of Practice. However, as submitted by Counsel Assisting, tanker filling points and hydrant manifolds are much more relevant to fire suppression, not its prevention.[398]

In effect, reliance on the minimum requirements under the Mine Fire Service Policy and Code of Practice meant that there was no preventive measure in place to protect the worked out areas of the mine from ember attack. That the areas of exposed coal unprotected by fixed sprays were the most heavily impacted by the Hazelwood mine fire confirms this conclusion.

The Board considers the Mine Fire Service Policy and Code of Practice and related policies are deficient in a number of other respects:

- The vegetation management requirements applying outside the perimeter of the mine do not apply to the worked out areas and mine floor, heightening the risk of fire and hindering access.
- There is no fixed requirement to ensure that all exposed coal is either able to be wetted down or covered by clay or some other fire retardant substance or otherwise rehabilitated at the earliest possible opportunity.
- In worked out areas of the mine where fixed sprays do exist, there is no procedural requirement to wet down coal faces on high fire risk days.

OPPORTUNITIES FOR ENHANCING FIRE PREVENTION MEASURES

The value of rehabilitation as a fire prevention measure is well recognised and was known both to GDF Suez[399] and the Mining Regulator.[400] GDF Suez has undertaken progressive rehabilitation of parcels of land throughout the mine, including the north-eastern corner of the mine. It is salient that this area of the mine was not burnt during the Hazelwood mine fire.

The Board is satisfied that while progressive rehabilitation is an extremely effective fire prevention measure, the practical obstacles raised by Mr Faithful are a real impediment to relying on rehabilitation as the primary strategy for fire prevention throughout the worked out areas of the Hazelwood mine. Nevertheless, it should be considered one of the suite of preventive measures available.

Each of the fire prevention measures canvassed as being potentially suitable for the worked out areas of the Hazelwood mine has advantages and disadvantages. It is not appropriate for the Board to advocate for any one of the particular methods without the benefit of a proper technical assessment of the feasibility of the measures and a thorough risk assessment that includes a cost benefit analysis. In reality, the most reasonably practicable control adopted by GDF Suez will probably involve a combination of methods depending on the particular area of the mine.

The Board recommends GDF Suez engage reputable external consultants to assist it to conduct a thorough risk assessment of the likelihood and consequences of the risk of fires in the worked out areas of the Hazelwood mine. The assessment must consider the most effective fire protection for the exposed coal surfaces in the worked out areas of the mine including:

- rehabilitation
- water coverage
- coverage by earth or some other substance
- treatment with a fire retardant, or
- a combination of these approaches.

GDF Suez should implement, as a matter of urgency, the most effective controls and treatments to eliminate or reduce the risk of fires as far as reasonably practicable.

Environment Victoria endorsed this recommendation.[401]

The Victorian Government also agreed with this recommendation, but noted that whether the risk assessment 'impacts on progressive rehabilitation would depend on the result of the risk assessment.'[402] The Board agrees with this observation. The list of potential control measures in this recommendation is not intended to be exhaustive, definitive or prescriptive. Rather, it is designed to ensure that, through the risk assessment process, the reasonable practicability of each of the potential control measures listed (or any combination of them) is genuinely explored. The most effective controls then need to be implemented to the extent that is reasonable practicable. The risk assessment may identify additional control measures that were not explored during the Inquiry.

In closing submissions, Counsel for GDF Suez maintained the position that a risk assessment had already been undertaken in accordance with the organisation's obligations under the OHS Regulations.[403] For the reasons identified above, the Board disagrees.

Mr Graham was more forthright and indicated that GDF Suez was committed to undertaking a review of fire risk in the worked out areas of the mine.[404]

In closing submissions, counsel for GDF Suez also took issue with being subject to an obligation to implement control measures recommended as part of a risk assessment, noting that 'insofar as the work of external consultants identifies reasonably practicable control measures, that will be the touchstone from there on. The touchstone is not a blanket requirement to implement what others say is a good idea.'[405] The Board agrees but suggests that if the most effective controls and treatments to eliminate or reduce the risk of fires identified out of the risk assessment are reasonably practicable, then GDF Suez is under an obligation to adopt them under r. 5.3.8(1) of the OHS Regulations.

For this reason, the Board considers it appropriate that GDF Suez should implement any such controls to the extent that they are effective and reasonably practicable.

OPPORTUNITIES FOR ENHANCING THE MINE FIRE SERVICE POLICY AND CODE OF PRACTICE

GDF Suez should thoroughly review its Mine Fire Service Policy and Code of Practice to ensure that, taking a risk assessment approach, it is suitable for prevention, preparedness to respond, mitigation and suppression of fires in all parts of the Hazelwood mine. The reviewed policy should reflect industry best practice as well as respond to the special features of the Hazelwood mine. The reviewed policy should be incorporated into the approved work plan for the mine.

The reviewed Policy should, as a minimum, address the:

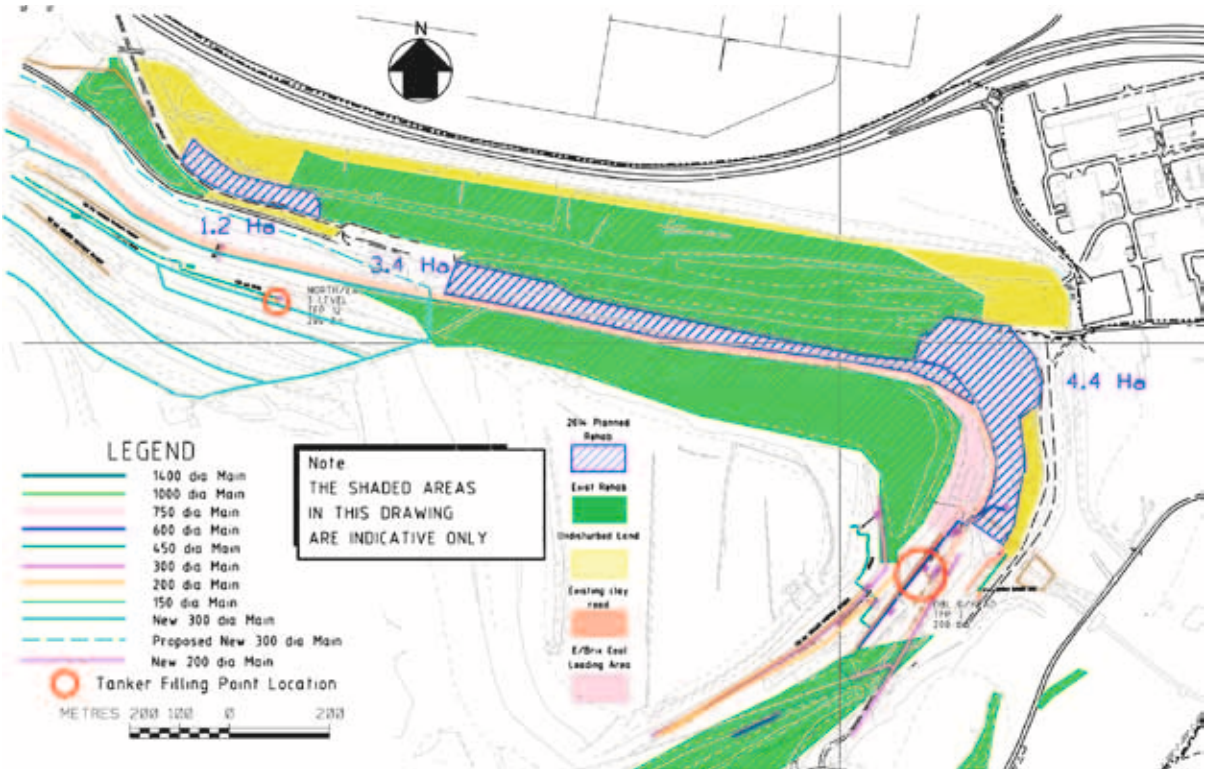
- regular removal of excess vegetation from all surfaces within the mine (including worked out batters) to reduce fire risk and improve access
- ability to prevent and suppress any fires that commence or burn into the worked out parts of the mine
- use of thermal detection and other imaging technologies by which fires can be spotted as soon as they commence
- ready availability of Compressed Air Foam System that are capable of operating in an open cut mine environment supported by camera technologies.

GDF Suez has already committed to:

- initiating 'a programme for reducing vegetation in the worked out areas of the northern batters to reduce fire risk (insofar as is consistent with OH&S requirements and the stability properties of the vegetation) commencing in the areas closest to Morwell'[406]
- clearing vegetation from the north-eastern batters by November 2014[407]
- maintaining and continuing to use the additional pipework located in the northern batters, which was installed during the 2014 fires[408]
- installing additional pipework and hydrants in the areas marked on the northern batters shown by the broken aqua coloured line in Figure 3.22 below (referred to by Mr Graham as the 'eastern section of the northern batters')[409]
- undertaking rehabilitation of approximately 20 hectares of land in the eastern section of the northern batters shown in hashed dark blue in Figure 3.22 below, by December 2014[410]
- conducting a review (to be undertaken by external consultants working with GDF Suez personnel) of the current pipework and condition in the areas of the mine other than the eastern section of the northern batters, with the outcome of the review to be communicated to the Mining Regulator and VWA[411]
- instigating wetting down of non-operational areas of the mine on Extreme Fire Danger Days.[412]

The Board affirms these commitments.

Figure 3.22 Proposed additional fire prevention measures by GDF Suez for 2014[413]



According to Mr Graham, these measures will have the effect that the shaded areas shown in Figure 3.22 are covered by:

- rehabilitation that has occurred prior to 2014
- rehabilitation proposed to be undertaken during 2014
- undisturbed land (ie grassed areas that do not contain exposed coal)
- sprinklers which are currently installed on the northern batters, or
- additional sprinklers to be installed on the northern batters.[414]

The Board commends GDF Suez for committing to swiftly implement these measures.

RECOMMENDATION 15

GDF Suez:

- conduct, assisted by an independent consultant, a risk assessment of the likelihood and consequences of fire in the worked out areas of the Hazelwood mine, and an assessment of the most effective fire protection for the exposed coal surfaces;
- prepare an implementation plan that ensures the most effective and reasonably practicable controls are in place to eliminate or reduce the risk of fire; and
- implement the plan.

RECOMMENDATION 16

GDF Suez:

- review its 'Mine Fire Service Policy and Code of Practice' so that it reflects industry best practice and ensures that, by taking a risk management approach, it is suitable for fire prevention, mitigation and suppression in all parts of the Hazelwood mine; and
- incorporate the revised 'Mine Fire Service Policy and Code of Practice' into the approved work plan for the Hazelwood mine.

1. Exhibit 59 – Statement of Kylie White, para. 32
2. Exhibit 59 – Statement of Kylie White, para. 33
3. Exhibit 59 – Statement of Kylie White, para. 35
4. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 5
5. Exhibit 59 – Statement of Kylie White, annexure KAW-3, pp. 9 & 10
6. Exhibit 59 – Statement of Kylie White, para. 36
7. Exhibit 59 – Statement of Kylie White, para. 43
8. Exhibit 59 – Statement of Kylie White, annexure KAW-3, pp. 52-93; White T1586:12-28
9. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 63
10. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 89
11. Exhibit 59 – Statement of Kylie White, para. 96
12. Exhibit 59 – Statement of Kylie White, para. 50
13. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 1-1
14. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 5-1
15. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 4-3
16. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 5-2
17. Exhibit 88 – Statement of James Faithful, para. 28
18. Exhibit 88 – Statement of James Faithful, para. 39
19. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 5-17
20. Mineral Resources Development Regulations 2002 (Vic) (repealed), r. 25(2), Schedule 13, cl. 8
21. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 9-1
22. Adapted from Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 9-2
23. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 9-2
24. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 57
25. Exhibit 59 – Statement of Kylie White, annexure KAW-3, pp. 35, 36 & 58
26. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 58
27. Exhibit 59 – Statement of Kylie White, annexure KAW-3, pp. 33-34 (emphasis added)
28. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 58
29. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 84
30. Exhibit 59 – Statement of Kylie White, para. 103
31. Exhibit 59 – Statement of Kylie White, para. 104
32. Exhibit 59 – Statement of Kylie White, para. 105
33. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-3
34. In this Chapter, the Earth Resources Regulation Branch of Department of State Development, Business and Innovation and its various predecessors are referred to as 'the Mining Regulator'.
35. White T1645:30 – T1646:2
36. Exhibit 88 – Statement of James Faithful, paras 32 & 33
37. Exhibit 88 – Statement of James Faithful, para. 32
38. Exhibit 88 – Statement of James Faithful, para. 34
39. Exhibit 88 – Statement of James Faithful, para. 60
40. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-3
41. Exhibit 88 – Statement of James Faithful, para. 37
42. Exhibit 88 – Statement of James Faithful, para. 40
43. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-6
44. Written submission of GDF Suez, 18 June 2014, para. 294
45. Exhibit 88 – Statement of James Faithful, paras 41-43
46. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-7
47. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-8
48. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-9
49. Exhibit 59 – Statement of Kylie White, para. 97
50. Exhibit 59 – Statement of Kylie White, paras 98 & 99
51. Exhibit 59 – Statement of Kylie White, para. 99; annexure KAW-23, p. 195
52. GDF Suez Summons, 07.19 GDF Suez Environmental Review Committee Performance Report for August 2013 meeting, p. 59
53. Exhibit 88 – Statement of James Faithful, annexure 4
54. Exhibit 88 – Statement of James Faithful, para. 49
55. Exhibit 88 – Statement of James Faithful, para. 50
56. Exhibit 88 – Statement of James Faithful, para. 50
57. Exhibit 60 – Statement of Robert Gaulton, paras 38 & 39; Exhibit 9 – Statement of Graeme Freshwater, para. 27
58. Exhibit 88 – Statement of James Faithful, para. 51

59. Adapted from GDF Suez Summons, 07.28 Progressive Rehabilitation Statistics
60. White T1616:2-9 cf Exhibit 88 – Statement of James Faithful, paras 38 & 40
61. White T1622:1-12; Faithful T1975:1-17; Graham T2255:21 – T2256:8
62. Faithful T1975:18-29; T1983:14-19
63. Faithful T1975:30 – T1976:6
64. Exhibit 88 – Statement of James Faithful, para. 52
65. Exhibit 88 – Statement of James Faithful, para. 53
66. See for example, Written submission of Environment Victoria, 13 May 2014, para. 2.4; Written submission of David Langmore, para. 2.12; Written submission of Samantha Hepburn, pp. 6-8. The written submission of Ratepayers Victoria Inc considered that there should be a 'contingency plan for an amount of money to be put aside by the industry that will pay for the demolition of power Stations and the final rehabilitation of these sites.'
67. Exhibit 59 – Statement of Kylie White, paras 113 & 114; Exhibit 88 – Statement of James Faithful, paras 15 & 16
68. Written submission of GDF Suez, 18 June 2014, para. 333; Exhibit 59 – Statement of Kylie White, para. 113
69. Exhibit 59 – Further statement of Kylie White, para. 2; annexure KAW-47
70. Exhibit 59 – Further statement of Kylie White, annexure KAW-49, p. 1
71. Second written submission of Environment Victoria, 24 June 2014, para 4(c)
72. Graham T2264:29 – T2265:15
73. White T1632:27 – T1633:5
74. Exhibit 59 – Statement of Kylie White, paras 116 & 117; White T1611:27 – T1612:8
75. Third written submission of the Victorian Government, 23 June 2014, para. 135
76. Second written submission of Environment Victoria, 24 June 2014, para. 110
77. Written submission of GDF Suez, 18 June 2014, paras 334 & 335
78. Written submission of GDF Suez, 18 June 2014, paras 336-337, 340
79. Second written submission of Environment Victoria, 24 June 2014, paras 116 & 120
80. Exhibit 10 – Statement of Steven Harkins, para. 11; Exhibit 13 – Statement of Robert Dugan, para. 27
81. Exhibit 7 – Statement of David Shanahan, annexure 1
82. Exhibit 7 – Statement of David Shanahan, annexure 1, p. 6
83. Exhibit 7 – Statement of David Shanahan, annexure 1, p. 6
84. Exhibit 10 – Statement of Steven Harkins, para. 15
85. Exhibit 10 – Statement of Steven Harkins, para. 16
86. Exhibit 13 – Statement of Robert Dugan, para. 31; Exhibit 10 – Statement of Steven Harkins, para. 16
87. Exhibit 13 – Statement of Robert Dugan, para. 31
88. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 38
89. GDF Suez Summons, 02.01 Slashing for Fire Season 2013/2014 – Annexure B – Scope of Works
90. GDF Suez Summons, 02.01 Slashing for Fire Season 2013/2014 – Annexure B – Scope of Works, p. 1
91. GDF Suez Summons, 02.01 Slashing for Fire Season 2013/2014 – Annexure B – Scope of Works, p. 2
92. GDF Suez Summons, 02.02 Fire Prevention – Slashing, Mulch & Mowing Layout Plan 2013/2014
93. Exhibit 13 – Statement of Robert Dugan, para. 31; GDF Suez Summons, 02.03 to 02.07 Reports on Slashing Progress, 3 December 2013 to 12 January 2014
94. Exhibit 10 – Statement of Steven Harkins, annexure 3
95. Exhibit 67 – Statement of Kevin Hayes, para. 6
96. Exhibit 67 – Statement of Kevin Hayes, attachment 27
97. Exhibit 10 – Statement of Steven Harkins, para. 17
98. Exhibit 12 – Mine Fire Instructions
99. Exhibit 12 – Mine Fire Instructions, p. 12
100. Exhibit 12 – Mine Fire Instructions, p. 12
101. Exhibit 12 – Mine Fire Instructions, pp. 7-10
102. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 14
103. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 14
104. Exhibit 4 – Statement of William Brown, annexure WB-3, pp. 29-31
105. Exhibit 4 – Statement of William Brown, annexure WB-3, pp. 29-31
106. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 16
107. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 17
108. Exhibit 4 – Statement of William Brown, annexure WB-3, pp. 7 & 8
109. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 35
110. Exhibit 4 – Statement of William Brown, annexure WB-3, pp. 15 & 16
111. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 32
112. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 32
113. Exhibit 13 – Statement of Robert Dugan, para. 28
114. Exhibit 90 – Statement of Richard Polmear, para. 20
115. Exhibit 4 – Statement of William Brown, para. 27; Brown T159:16-23
116. Exhibit 90 – Statement of Richard Polmear, annexure 4, p. 5

117. Exhibit 90 – Statement of Richard Polmear, annexure 4, p. 1
118. Exhibit 90 – Statement of Richard Polmear, annexure 4, p. 2
119. Exhibit 90 – Statement of Richard Polmear, annexure 2, pp. 3 & 4
120. Exhibit 90 – Statement of Richard Polmear, annexure 2, figure 2
121. Exhibit 59 – Statement of Kylie White, annexure KAW-28, p. 14
122. Exhibit 59 – Statement of Kylie White, annexure KAW-28, p. 14
123. Exhibit 59 – Statement of Kylie White, annexure KAW-28, p. 14
124. Exhibit 90 – Statement of Richard Polmear, annexure 4, pp. 10 & 11
125. Exhibit 4 – Statement of William Brown, para. 28; annexure WB-2
126. Exhibit 4 – Statement of William Brown, annexure WB-2, p. 20
127. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 17
128. Exhibit 90 – Statement of Richard Polmear, paras 2-5
129. Exhibit 90 – Statement of Richard Polmear, para. 3
130. Written submission of GDF Suez, 18 June 2014, para. 253
131. Polmear T2033:21-26
132. Polmear T2033:27 – T2034:2
133. Polmear T2034:27 – T2035:14
134. Polmear T2035:25-28
135. Exhibit 90 – Statement of Richard Polmear, para. 22
136. Exhibit 90 – Statement of Richard Polmear, para. 11
137. Exhibit 90 – Statement of Richard Polmear, para. 12
138. Exhibit 90 – Statement of Richard Polmear, paras 14 & 15
139. Exhibit 90 – Statement of Richard Polmear, paras 16 & 19
140. Exhibit 90 – Statement of Richard Polmear, para. 23
141. Exhibit 90 – Statement of Richard Polmear, annexure 3, p. ii
142. Exhibit 90 – Statement of Richard Polmear, annexure 3, p. 4
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147. Polmear T2053:24 – T2054:1
148. Exhibit 90 – Statement of Richard Polmear, annexure 3, p. 7
149. Exhibit 90 – Statement of Richard Polmear, annexure 3, p. 2
150. Exhibit 90 – Statement of Richard Polmear, annexure 3, p. 11
151. Exhibit 90 – Statement of Richard Polmear, annexure 3, p. 13
152. Exhibit 90 – Statement of Richard Polmear, para. 27
153. Polmear T2056:3-9
154. Exhibit 13 – Statement of Robert Dugan, annexure 11
155. Exhibit 90 – Statement of Richard Polmear, paras 29 & 30
156. Polmear T2057:5-9
157. Polmear T2059:13 – T2060:3; Exhibit 81 – Fire services pipe network diagrams
158. Polmear T2050:12-17
159. Exhibit 92 – Expert report of Roderic Incoll, para. 276
160. White T1587:23-28
161. Written submission of GDF Suez, 18 June 2014, para. 274
162. Written submission of GDF Suez, 18 June 2014, para. 276
163. White T1680:16-20
164. Exhibit 92 – Expert report of Roderic Incoll, paras 186 & 187
165. Exhibit 92 – Expert report of Roderic Incoll, para. 188; Exhibit 4 – Statement of William Brown, annexure WB-3, pp. 29-31
166. Exhibit 92 – Expert report of Roderic Incoll, paras 190 & 194. See also Cliff T2088:11-19
167. Exhibit 92 – Expert report of Roderic Incoll, para. 189
168. Exhibit 92 – Expert report of Roderic Incoll, paras 195 & 196
169. Exhibit 92 – Expert report of Roderic Incoll, para. 197
170. Faithful T2006:28 – T2007:12
171. Cliff T2110:24 – T2111:5
172. Exhibit 92 – Expert report of Roderic Incoll, paras 230-234
173. Exhibit 92 – Expert report of Roderic Incoll, paras 201-212
174. Exhibit 92 – Expert report of Roderic Incoll, paras 213-215
175. Incoll T2216:7-29

176. Exhibit 92 – Expert report of Roderic Incoll, paras 218 & 219
177. Written submission of Roderic Incoll, para. 15
178. Incoll T2169:25-30; T2206:20-28
179. Exhibit 9 – Statement of Graeme Freshwater, paras 13 & 16
180. Exhibit 9 – Statement of Graeme Freshwater, para. 20
181. Written submission of GDF Suez, 18 June 2014, paras 254-261
182. Incoll T2206:29 – T2207:14
183. Incoll T2216:30 – T2217:17
184. Exhibit 92 – Expert report of Roderic Incoll, paras 197-199
185. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-3; Faithful T2008:11-23
186. Exhibit 59 – Statement of Kylie White, paras 99 & 100; White T1647:19-26
187. Exhibit 70 – Statement of Leonard Neist, para. 29
188. White T1642:30 – T1644:06; T1622:1 – T1623:12; T1660:9-27
189. Cliff T2113:28 – T2115:12
190. Gaulton T1702:30 – T1704:23
191. Exhibit 9 – Statement of Graeme Freshwater, paras 26-28
192. Exhibit 88 – Statement of James Faithful, para. 64
193. Faithful T1993:12 – T1994:10
194. Second written submission of Environment Victoria, 24 June 2014, paras 55-62
195. Faithful T2001:24 – T2002:12
196. Faithful T2002:10 – T2006:27
197. Exhibit 88 – Statement of James Faithful, para. 34(e)
198. Exhibit 60 – Statement of Robert Gaulton, para. 46; Gaulton T1704:3 – T1705:27
199. Exhibit 91 – Expert report of David Cliff, p. 15; Cliff T2110:24 – T2111:5
200. Cliff T2111:6-22; T2113:28 – T2114:12; T2126:20-29
201. Written submission of GDF Suez, 18 June 2014, para. 306
202. Gaulton T1705:28 – T1706:4
203. Gaulton T1707:6-12
204. Cliff T2127:1-9
205. Faithful T2018:12-24
206. Faithful T2017:10-23
207. Faithful T2019:5-8
208. Faithful T2017:1-9
209. Faithful T1977:23 – T1978:1; T2015:21 – T2016:13, T2022:14-20
210. Second written submission of Environment Victoria, 24 June 2014, para. 37
211. Second written submission of Environment Victoria, 24 June 2014, paras 38 & 39
212. Cliff T2125:27 – T2126:3
213. Cliff T2126:4-13
214. Exhibit 91 – Expert report of David Cliff, p. 6; Cliff T2077:1-8
215. Cliff T2111:31 – T2112:17
216. Gaulton T1706:22-27
217. Cliff T2126:14-19; Incoll T2209:14-20; Faithful T2019:9-12; T2023:22-29
218. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 9-1
219. AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, p. v
220. AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, p. 1
221. AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, p. 1
222. AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, p. 1
223. Cliff T2124:5-17
224. Adapted from AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, pp. 3-5
225. AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, para. 4.1
226. AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, para. A4.4.6.3
227. Incoll T2217:18 – T2218:5
228. Exhibit 91 – Expert report of David Cliff, p. 15
229. Exhibit 89 – Safety Management System Manual
230. T1931:24 – T1932:22
231. Exhibit 89 – Safety Management System Manual, p. 3
232. Exhibit 89 – Safety Management System Manual, H&S Health and Safety Policy, p. 1
233. Exhibit 89 – Safety Management System Manual, Hazard Identification Risk Assessment and Control, p. 1
234. Exhibit 89 – Safety Management System Manual, Hazard Identification Risk Assessment and Control, p. 3 (emphasis added)

235. Exhibit 89 – Safety Management System Manual, Hazard Identification Risk Assessment and Control, p. 6 (emphasis added)
236. Exhibit 89 – Safety Management System Manual, Hazard and Risk Register
237. Exhibit 89 – Safety Management System Manual, Hazard and Risk Register, p. 3
238. Exhibit 89 – Safety Management System Manual, Hazard and Risk Register, pp. 19 & 41
239. Exhibit 89 – Safety Management System Manual, Hazard and Risk Register, p. 19
240. Cliff T2123:23 – T2124:4
241. Written submission of GDF Suez, 18 June 2014, para. 360; Exhibit 89 – Bundle of GDF Suez documents
242. Exhibit 89 – Bundle of GDF Suez documents, Executive Summary: Safety Assessment of Major Mining Hazards, p. 2
243. Exhibit 89 – Bundle of GDF Suez documents, Safety Assessment of Major Mining Hazards: Stage 1 – Identification of Major Mining Hazards, p.11 (emphasis added)
244. Cliff T2106:17-29
245. Adapted from Exhibit 89 – Bundle of GDF Suez documents, Safety Assessment of Major Mining Hazards: Stage 1 – Identification of Major Mining Hazards, December 2003, appendix 1, p. 1
246. Written submission of GDF Suez, 18 June 2014, para. 360(b)
247. Exhibit 68 – GHD Report for International Power Hazelwood, Report for Major Mining Hazards Assessment Interim Submission (draft)
248. Exhibit 68 – GHD Report for International Power Hazelwood, Report for Major Mining Hazards Assessment Interim Submission (draft), pp. i & 6-7
249. Exhibit 68 – GHD Report for International Power Hazelwood, Report for Major Mining Hazards Assessment Interim Submission (draft), p. 1
250. Exhibit 68 – GHD Report for International Power Hazelwood, Report for Major Mining Hazards Assessment Interim Submission (draft), p. 4
251. Adapted from Exhibit 68 – GHD Report for International Power Hazelwood, Report for Major Mining Hazards Assessment Interim Submission (draft), p. 4
252. Cliff T2086:26 – T2087:21
253. Exhibit 68 – GHD Report for International Power Hazelwood, Report for Major Mining Hazards Assessment Interim Submission (draft), p. 5
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257. Exhibit 67 – Statement of Kevin Hayes, paras 3-5
258. Exhibit 67 – Statement of Kevin Hayes, para. 5
259. Exhibit 67 – Statement of Kevin Hayes, attachment 19, pp. 278 & 279
260. GDF Suez Summons, 12.02 Minutes of work party review of MMH#7 Mine Fire, p. 1
261. GDF Suez Summons, 12.02 Minutes of work party review of MMH#7 Mine Fire, pp. 1 & 2
262. GDF Suez Summons, 12.02 Minutes of work party review of MMH#7 Mine Fire, p. 2
263. Exhibit 67 – Statement of Kevin Hayes, attachment 20, p. 120
264. GDF Suez documents, 5 May 2014, OHS Assessment for Major Mining Hazard 7 – Mine Fire (Major Fire)
265. GDF Suez documents, 5 May 2014, OHS Assessment for Major Mining Hazard 7 – Mine Fire (Major Fire)
266. Exhibit 91 – Expert report of David Cliff, p. 12
267. Cliff T2101:29 – T2102:16
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269. Cliff T2088:7-11
270. Exhibit 91 – Expert report of David Cliff, p. 15
271. Exhibit 92 – Expert report of Roderic Incoll, paras 78 & 79
272. Exhibit 91 – Expert report of David Cliff, p. 8
273. Written submission of GDF Suez, 18 June 2014, paras 361 & 362
274. Cliff T2090:26 – T2091:4
275. Cliff T2091:5-16
276. Exhibit 13 – Statement of Robert Dugan, para. 13
277. Exhibit 90 – Statement of Richard Polmear, annexure 3, figure 25
278. GDF Suez Summons, 01.12–01.46, Operational Fire Reports
279. Exhibit 13 – Statement of Robert Dugan, para. 13
280. Exhibit 90 – Statement of Richard Polmear, annexure 3, p. 6 cf. Polmear T2042:9-14
281. Exhibit 90 – Statement of Richard Polmear, para. 19
282. Polmear T2050:25 – T2051:8; Counsel for GDF Suez T2052:3 – T2053:23
283. Exhibit 13 – Statement of Robert Dugan, para. 14
284. Exhibit 4 – Statement of William Brown, annexure WB-3 p. 14
285. Exhibit 59 – Statement of Kylie White, paras 130-133
286. Exhibit 59 – Statement of Kylie White, paras 138-142
287. Exhibit 59 – Statement of Kylie White, paras 143-150
288. Exhibit 59 – Statement of Kylie White, paras 151-155
289. Exhibit 59 – Statement of Kylie White, paras 156 & 157; annexure KAW-40
290. Exhibit 13 – Statement of Robert Dugan, annexure 2
291. Exhibit 13 – Statement of Robert Dugan, annexure 6
292. Exhibit 13 – Statement of Robert Dugan, annexure 7

293. Exhibit 59 – Statement of Kylie White, annexure KAW-40, p. 4
294. Exhibit 59 – Statement of Kylie White, annexure KAW-40, p. 4
295. Exhibit 59 – Statement of Kylie White, annexure KAW-40, p. 4
296. Exhibit 59 – Statement of Kylie White, annexure KAW-40, p. 5
297. Exhibit 59 – Statement of Kylie White, annexure KAW-40, p. 7 (emphasis added)
298. Exhibit 59 – Statement of Kylie White, annexure KAW-40, p. 9
299. Exhibit 13 – Statement of Robert Dugan, para. 21
300. Exhibit 13 – Statement of Robert Dugan, annexure 6, p. 4
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306. Exhibit 13 – Statement of Robert Dugan, para. 19
307. Exhibit 13 – Statement of Robert Dugan, annexure 6, appendix A; Exhibit 93 – Statement of Romeo Prezioso, paras 12-51
308. Exhibit 59 – Statement of Kylie White, paras 167-172; Written submission of the Victorian Government, 22 May 2014, paras 5.44-5.49
309. Exhibit 13 – Statement of Robert Dugan, annexure 8
310. Exhibit 13 – Statement of Robert Dugan, paras 25 & 26
311. Written submission of GDF Suez, 18 June 2014, para. 242
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313. Exhibit 59 – Statement of Kylie White, annexure KAW-40, p. 9
314. Exhibit 92 – Expert report of Roderic Incoll, para. 215
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318. Prezioso T2227:16-20
319. Prezioso T2227:1-12
320. Prezioso T2226:15-16; T2227:26
321. Exhibit 93 – Statement of Romeo Prezioso, para. 93
322. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 5, s. 1.1
323. White T1642:19-22
324. Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 63
325. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 5-17
326. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 9-1
327. Written submission of GDF Suez, 18 June 2014, paras 274-276
328. White T1680:16-20
329. Written submission of GDF Suez, 18 June 2014, para. 278(a)
330. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 17; Exhibit 90 – Statement of Richard Polmear, annexure 4, para. 4.4; Written submission of GDF Suez, 18 June 2014, para. 263
331. Polmear T2034:27 – T2035:14; Exhibit 90 – Statement of Richard Polmear, para. 22
332. Exhibit 92 – Expert report of Roderic Incoll, para. 215
333. Exhibit 90 – Statement of Richard Polmear, para. 27; Polmear T2056:3-9
334. Written submission of Counsel Assisting, 17 June 2014, para. 52
335. Third written submission of the Victorian Government, 23 June 2014, para. 125
336. Polmear T2061:1-12
337. Polmear T2061:6-8; Dugan T411:13-20
338. Exhibit 88 – Statement of James Faithful, annexure 2, para. 18
339. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 35
340. Faithful T389:9-15
341. Exhibit 14 – Statement of Anthony Lalor, paras 24, 27 & 28
342. Dugan T410:26-30
343. Exhibit 59 – Statement of Kylie White, para. 111; Exhibit 88 – Statement of James Faithful, para. 58
344. White T1664:17-22
345. Neist T1826:8-16; T1837:28 – T1838:2
346. Exhibit 89 – Safety Management System Manual, Hazard Identification Risk Assessment and Control, pp. 1-6
347. Neist T1837:1-27; Written submission of GDF Suez, 18 June 2014, para. 351
348. Neist T1837:28 – T1838:11
349. Neist T1824:4-10
350. Exhibit 92 – Expert report of Roderic Incoll, paras 78 & 79; Exhibit 91 – Expert report of David Cliff, pp. 12-15

351. Neist T1828:4 – T1829:27
352. Counsel for GDF Suez T2506:7-12
353. Second written submission of the Victorian Government, 18 June 2014, para. 9.13
354. Exhibit 4 – Statement of William Brown, annexure WB-3, p. 14; Exhibit 59 – Statement of Kylie White, annexure KAW-3, p. 63
355. Exhibit 60 – Statement of Robert Gaulton, paras 8-13
356. See for example, Neist T1828:26 – T1829:1
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359. Exhibit 7 – Statement of David Shanahan, annexure 1, p. 6, s. 6.7
360. Exhibit 82 – Correspondence provided by GDF Suez in relation to neighbouring timber plantations
361. AS/NZS 4801:2001 Occupational health and safety management systems—Specification with guidance for use, 15 November 2001, para. A4.4.6.3; Incoll T2217:18 – T2218:5; Exhibit 91 – Expert report of David Cliff, p. 15
362. Counsel Assisting T2338:6-16
363. Incoll T2160:27 – T2162:9
364. Incoll T2162:10-15
365. Written submission of GDF Suez, 18 June 2014, para. 367; Neist T1837:1-5
366. Counsel for GDF Suez T2539:10-15
367. Exhibit 70 – Statement of Leonard Neist, paras 9 & 10, 28; Exhibit 31 – Statement of Robert Kelly, paras 14 & 15; Third written submission of the Victorian Government, 23 June 2014, para. 128
368. Second written submission of the Victorian Government, 18 June 2014, para 9.4
369. Second written submission of GDF Suez, 23 June 2014, para. 11
370. *Occupational Health and Safety Act 2004* (Vic), s. 20(2)
371. Neist T1835:14-29
372. Graham T2276:25 – T2277:7
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375. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements, p. 5
376. Polmear T2057:5-9
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378. Incoll T2216:30 – T2217:17
379. Exhibit 92 – Expert report of Roderic Incoll, paras 230-234
380. Exhibit 94 – Bundle of three documents created by George Graham, mine fire inquiry proposals for improvements, p. 4
381. Exhibit 13 – Statement of Robert Dugan, annexure 6
382. Exhibit 93 – Statement of Romeo Prezioso, paras 98-115
383. Exhibit 93 – Statement of Romeo Prezioso, para. 57
384. Exhibit 13 – Statement of Robert Dugan, paras 25 & 26
385. Prezioso T2229:5-9
386. Written submission of GDF Suez, 18 June 2014, para. 244
387. Exhibit 91 – Expert report of David Cliff, p. 10
388. Written submission of GDF Suez, 18 June 2014, para. 251
389. Graham T2274:28 – T2275:13
390. By operation of r 1.1.7 of the Occupational Health and Safety Regulations 2007 (Vic), rr. 5.3.7 and 5.3.8 set out the way in which a person's duty or obligation under ss. 21 and 23 of the *Occupational Health and Safety 2004* (Vic) is to be performed in relation to the matters and to the extent set out in those regulations
391. Exhibit 65 – Statement of Adam Watson, paras 7-9
392. Third written submission of the Victorian Government, 23 June 2014, para. 129
393. Graham T2257:4 – T2258:4
394. Graham T2273:22 – T2274:14
395. Exhibit 89 – Safety Management System Manual, H&S Health and Safety Policy, p. 1
396. Graham T2259:8 – T2260:10
397. Graham T2272:1-18
398. Written submission of Counsel Assisting, 17 June 2014, para. 53
399. Exhibit 59 – Statement of Kylie White, annexure KAW-12, p. 6-3; Faithful T2008:11-23
400. Exhibit 59 – Statement of Kylie White, paras 99 & 100; White T1647:19-26
401. Second written submission of Environment Victoria, 24 June 2014, para. 10
402. Third written submission of the Victorian Government, 23 June 2014, para. 130
403. Counsel for GDF Suez T2552:30 – T2553:10
404. Graham T2274:28 – T2275:13
405. Counsel for GDF Suez T2553:11-30
406. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, p. 4

407. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, p. 4
408. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, p. 4
409. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, pp. 4 & 5
410. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, pp. 6 & 7; Exhibit 88 – Statement of James Faithful, para. 53
411. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, p. 5
412. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, p. 5
413. Exhibit 94 – Bundle of three documents created by George Grahram, map
414. Exhibit 94 – Bundle of three documents created by George Grahram, mine fire inquiry proposals for improvements, p. 5

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PART FOUR HEALTH AND WELLBEING

4.1 Health and wellbeing – background
4.2 Chronology of events
4.3 Environmental effects and response
4.4 Firefighter health
4.5 Health effects
4.6 Health response
4.7 Relief and recovery

4.1 HEALTH AND WELLBEING – BACKGROUND

OVERVIEW

This Chapter provides a general overview of the emissions produced from a coal fire and their potential adverse health effects. Subsequent chapters examine the effects of smoke and ash from the Hazelwood mine fire on the local community in detail.

Under its Terms of Reference, the Board of Inquiry must report on the measures taken by GDF Suez, emergency services, and other relevant government agencies in respect of the health and wellbeing of communities affected by the Hazelwood mine fire. In order to examine this, the environmental and health issues caused by the Hazelwood mine fire first need to be identified and explained. A brief overview of the existing health status of the Latrobe Valley also provides valuable context.

When coal is burnt it produces a number of different pollutants. Pollutants produced during the Hazelwood mine fire are similar to, but not the same as, pollutants produced during the normal coal combustion process.

The key pollutants emitted during the Hazelwood mine fire were carbon monoxide, particulate matter, nitrogen dioxide, sulphur dioxide, polycyclic aromatic hydrocarbons, volatile organic compounds, dioxins and furans, and heavy metals. Each of these pollutants has been linked to potential adverse health effects. Some have immediately noticeable health impacts and others have the potential to produce longer-term adverse health effects.

The State Environment Protection Policy (Ambient Air Quality) provides standards for each of the key pollutants. The standards are used to monitor the ambient air. However they are not designed for use in a pollution emergency. Most of the key pollutants produced during the Hazelwood mine fire are subject to ambient air quality standards.

The Hazelwood mine fire also produced a significant amount of ash. Based on the information provided, the Board considers that the ash produced was not 'fly ash', which is a by-product at a coal-fired power station. The ash produced from the mine fire was nonetheless an irritant, and caused significant distress to the community.

The information in this Chapter has been provided in large part by environmental and health experts engaged by the Board of Inquiry, Ms Claire Richardson, Managing Director and Principal Consultant, Air Noise Environment Pty Ltd, and Professor Donald Campbell, Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health.

BROWN COAL AND COAL COMBUSTION

Brown coal, also known as lignite, is mined at the Hazelwood mine. Brown coal is a soft, dark brown sedimentary rock that forms naturally in the ground. Unlike other types of coal, brown coal has high moisture content and is made up of highly volatile matter. This makes it easy to burn as a fuel for power generation, but also makes it susceptible to spontaneous combustion.[1]

Where brown coal is found in thick seams near the earth's surface (as is the case at the Hazelwood mine), it can be mined on a large scale using open-cut methods. The Latrobe Valley has large deposits of brown coal and the Hazelwood Power Station generates approximately 25 per cent of Victoria's electricity.[2]

In order to generate electricity, brown coal is first pulverised and then burned in large-scale boilers. The heat from the burning coal boils water, and the steam produced is then used to drive turbines that create electricity.[3]

COAL COMBUSTION DURING THE HAZELWOOD MINE FIRE

When coal combusts it produces smoke and ash. During the Hazelwood mine fire, coal burned outside the industrial machinery made to house burning coal, and without any type of processing. This uncontrolled and open setting meant that coal burned at varying temperatures, and emitted smoke and ash that were different to that produced by the power station stacks.[4] In his evidence to the Board, independent expert Professor Donald Campbell, Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health, advised that the smoke produced from a coal fire is different to that of a bushfire. In brown coal fires, the carbon monoxide levels are higher and polycyclic aromatic hydrocarbons (PAHs) and volatile organic compounds (VOCs) are a concern.[5]

SMOKE

WHAT IS IN SMOKE?

Smoke is made up of a number of different sized particles, water vapour and gases. Larger particles are often visible to the eye and produce the visible haze of smoke. These particles are generally too large to be breathed into the lungs, but can irritate the eyes, nose and throat. Smaller particles cannot be seen and are small enough to be breathed deeply into the lungs. They can cause a range of adverse health effects.[6]

Smoke produced from the Hazelwood mine fire was similar to, but not exactly the same as smoke produced from a bushfire.

Carbon is the principal element found in coal. Coal includes a number of other elements and compounds, many of which are released when coal combusts. The brown coal found in the Latrobe Valley has a moisture content of approximately 60 per cent, and contains low levels of nitrogen and sulphur, discrete minerals, and minute levels of heavy metals.[7] There are no reported health studies on the impacts of brown coal fires on a community in circumstances similar to the Hazelwood mine fire.[8] However, the greatest risk to public health from the Hazelwood mine fire was from fine smoke particles.[9] In this regard, the risk was similar to risks well known from bushfire smoke.

When evaluating air quality generally, there are three major pollutant categories to consider:

- particulate matter – PM_{10} and $PM_{2.5}$
- gases – carbon monoxide, ozone, sulphur dioxide and nitrogen dioxide
- air toxins – volatile organic compounds and metals.[10]

The Hazelwood mine fire produced pollutants from these three major categories, including the following:

- carbon monoxide
- particulate matter
- sulphur dioxide
- nitrogen dioxide
- volatile organic compounds
- ozone
- polycyclic aromatic hydrocarbons
- dioxins and furans
- metals (magnesium, manganese, mercury and zinc).[11]

VISIBILITY

The Victorian State Environmental Protection Policy (Ambient Air Quality) includes visibility reducing particles as a measure of air quality. The Policy sets the air quality goal and objective for visibility (minimum visual distance) at 20 kilometres for an average of one hour.[12] On 16 February 2014, visibility in Morwell was down to between 300 and 500 metres.[13]

CARBON MONOXIDE

Carbon monoxide is an odourless, tasteless, colourless gas. It is produced as a result of incomplete combustion of coal. Carbon monoxide is an environmental hazard in coal mines and coal-fired power stations. It usually disperses very quickly in open environments with circulating air.[14]

Carbon monoxide is absorbed through the lungs. When breathed in, it reduces the ability of blood to carry oxygen around the body tissues and vital organs. Carbon monoxide combines with haemoglobin in the blood to form carboxyhaemoglobin. Carboxyhaemoglobin reduces the capacity of the blood to carry oxygen. The short-term effects of exposure to carbon monoxide are summarised in Figure 4.1.

Figure 4.1 Short-term effects of carbon monoxide[15]

Concentration	Symptoms
35 ppm (0.0035%)	Headaches and dizziness within 6 to 8 hours of constant exposure
100 ppm (0.01%)	Slight headache within 2 to 3 hours of exposure
200 ppm (0.02%)	Slight headache within 2 to 3 hours of exposure: loss of judgement
400 ppm (0.04%)	Frontal headache within 1 to 2 hours of exposure
800 ppm (0.08%)	Dizziness, nausea, and convulsions within 45 minutes of exposure: insensible within 2 hours
1,600 ppm (0.16%)	Headache, tachycardia, dizziness, and nausea within 20 minutes of exposure; death in less than 2 hours of exposure
3,200 ppm (0.32%)	Headache, dizziness and nausea within 5 to 10 minutes of exposure. Death within 30 minutes of exposure
6,400 ppm (0.64%)	Headache and dizziness in 1 to 2 minutes of exposure. Convulsions, respiratory arrest, and death in less than 20 minutes
12,800 ppm (1.28%)	Unconsciousness after 2 to 3 breaths. Death in less than 3 minutes of exposure

In addition to the short-term effects listed above, Professor Campbell advised the Board that increased exposure to carbon monoxide can lead to long-term cardiac and neurological abnormalities, and potentially to foetal injury as a result of hypoxia in the womb.[16]

Given its toxic nature at high levels, the potential short-term adverse health effects of carbon monoxide are usually the immediate health focus when increased levels are observed.

PARTICULATE MATTER

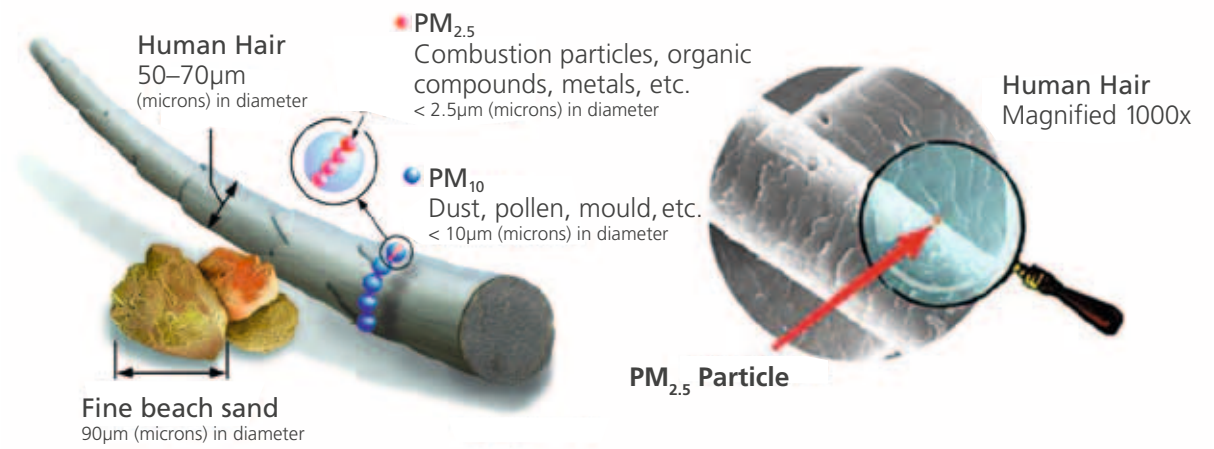
Particulate matter is also known as particle pollution or particles. Particulate matter is a complex mixture of very small particles and liquid droplets that can combine to make dust, soot and smoke.[17] Particulate matter occurs both naturally (for example, it is found in dust storms and even sea spray) as well as through human-related activities, such as wood burning, vehicle emissions and industrial processes. Particulate matter primarily consists of carbon, but also includes transition elements and hydrocarbons.[18] The most important chemical constituents of particulate matter are sulphate, nitrate, ammonium, other organic ions (sodium, potassium, calcium, magnesium and chloride), organic chemicals, metals, and soil or dust particles.[19]

Particulate matter is grouped into two broad categories:

- PM_{10} – these particles are equal to or smaller than 10 micrometres in diameter. They are inhalable coarse particles such as those found near roadways, farming operations, mining operations, and in dust storms.
- $PM_{2.5}$ – these are very fine particles equal to or smaller than 2.5 micrometres in diameter. They are found in smoke and haze. The source of these particles is primarily emissions from coal mines or forest fires, or from other combustion processes, such as those that occur in petrol or diesel vehicles, and wood burning.[20]

Figure 4.2 shows just how small both PM_{10} and $PM_{2.5}$ are compared to a human hair and grains of fine beach sand.

Figure 4.2 PM_{10} and $PM_{2.5}$ size in comparison to a human hair and fine beach sand[21]



Professor Campbell told the Board that once inhaled particulate matter can affect the heart and lungs, and cause adverse health effects.[22] He advised that coarse particles (PM_{10}) can settle in the bronchi and lungs and cause health problems, but fine particles ($PM_{2.5}$) have demonstrated the greatest impact on health. Due to their small size $PM_{2.5}$ can travel deep into the lungs where they can trigger inflammation or deposit potentially cancerous substances.[23]

Potential adverse health effects from exposure to particulate matter include respiratory illnesses (such as asthma and bronchitis), heart disease, reduced lung function, increased respiratory symptoms, adverse birth outcomes, childhood respiratory diseases and premature death.[24] The lung cancer risk associated with fine particulate matter is comparable to that faced by non-smokers living with smokers who are exposed to second hand smoke.[25]

The greater the exposure to particulate matter, the more likely a person will suffer an adverse health effect. There is no guaranteed safe level.[26]

The predominant short and long-term effects of exposure to $PM_{2.5}$ are summarised in Figure 4.3.

Figure 4.3 Predominant short and long-term effects of exposure to fine particulate matter ($PM_{2.5}$)[27]

	Short-term effect	Long-term effect
$PM_{2.5}$ (intensity dependent)	• Premature birth, low birth weight (for exposed foetuses) • Respiratory symptoms • New asthma • Worse asthma • Cardio-respiratory morbidity and mortality • Diabetes	• Lung growth retardation (for exposed foetuses) • Respiratory symptoms • New asthma • Worse asthma • Cardio-respiratory morbidity and mortality

SULPHUR DIOXIDE

Sulphur dioxide is one of a group of highly reactive gases known as sulphur oxides. Sulphur dioxide is invisible and has a sharp smell. It is produced through combustion processes, including coal combustion. When coal combusts, sulphur in the coal is turned into sulphur oxides, primarily sulphur dioxide. The environmental effects of sulphur dioxide include acidification of soil and surface water. Sulphur dioxide also contributes to air pollution by creating secondary particulate matter.[28]

The known potential human health effects of sulphur dioxide include:

- adverse effects on the respiratory system and lung function
- irritation of the eyes, throat and lungs
- inflammation of the respiratory tract causing coughing and mucous secretion
- aggravation of asthma and chronic bronchitis.[29]

NITROGEN DIOXIDE

Nitrogen dioxide is one of a group of highly reactive gases known as nitrogen oxides. Nitrogen dioxide has a sharp, acrid like odour. It is produced both naturally and by combustion processes involved in burning fossil fuels like coal, and through vehicle emissions. Nitrogen dioxide contributes to the formation of photochemical smog, which is the haze seen when sunlight falls on a mixture of chemicals in the air. Nitrogen dioxide can also adversely affect the health of water ecosystems.[30]

The known potential human health effects of nitrogen dioxide include:

- increased hospital admissions for respiratory disease
- decreased lung function
- cardiovascular disease
- increased respiratory problems (children and the elderly are particularly susceptible).

People with asthma are often sensitive to nitrogen dioxide.[31]

VOLATILE ORGANIC COMPOUNDS

VOCs are emitted as gases and are made up of a number of components, including a high amount of carbon. VOCs are commonly scattered throughout the atmosphere and are often the cause of odours in the air. They can be produced naturally (mostly from plants) as well as from human activity, including coal combustion. VOCs contribute to the formation of photochemical smog.[32]

Very little is known about the health effects of VOCs released from coal mine fires.[33] The release of these elements represents an unquantifiable contribution to the additional health risks associated with the mine fire. One VOC that is a known human carcinogen is benzene, which is a chemical found in environmental tobacco smoke, stored fuels, and exhaust from cars.

OZONE

Ozone is a gas that is formed by the chemical reaction of VOCs and nitrogen dioxide in sunlight. It creates photochemical smog. Ozone has a sharp odour similar to chlorine, and is easily detectable even in small concentrations. The environmental effects of ozone include damage to vegetation, such as stunted tree growth.[34]

The known potential human health effects of ozone include:

- coughing
- throat irritation
- pain, burning, or discomfort in the chest when taking a deep breath
- chest tightness, wheezing, or shortness of breath
- increased asthma attacks and hospital admissions for respiratory illness.[35]

POLYCYCLIC AROMATIC HYDROCARBONS

PAHs are found in coal and other fossil deposits and can be generated, for example, when meat is cooked at very high temperatures. In addition to being found in raw coal, PAHs are a component of particulate matter produced from incomplete coal combustion (as was the case in the Hazelwood mine fire). Different types of combustion or burning produce different types of PAHs.[36]

The health effects of exposure to PAHs are unclear. However, some studies have linked prenatal exposure to PAHs with low birth weight.[37]

DIOXINS AND FURANS

Dioxins and furans are environmental pollutants found in a number of sources, including animal products. They are also produced by industrial processes (including coal-fired power stations), and fires that involve carbon (including coal fires). They are commonly found in air, soil, sediments and food. Dioxins and furans are introduced into the environment through the atmosphere as trace products of combustion. Dioxins and furans are harmful to wildlife and livestock.[38]

The known potential human health effects of dioxins and furans include:

- skin lesions (short-term exposure)
- immunotoxicity (long-term exposure)
- developmental and neurodevelopmental effects (long-term exposure)
- thyroid effects (long-term exposure).

The group most vulnerable to dioxins and furans is unborn babies.[39]

HEAVY METALS

Heavy metals (such as magnesium, manganese, mercury and zinc) do not break down in the environment, and some accumulate in plants and animals if they cannot be excreted.[40] Plants and animals can be poisoned by small amounts of heavy metals that accumulate over long periods of time or through ongoing exposure.[41] The concentration of these elements in ambient (outdoor) air may contribute to particulate matter toxicity.[42]

INTERACTIONS OF AIR POLLUTANTS

Air pollutants can interact in the air as well as at the biological level (in humans, animals and plants). Interactions between air pollutants change the toxicity of the pollution mixture.[43]

Professor Campbell told the Board that very few epidemiological studies have examined the adverse health potential of 'mixed' pollutants. He also advised that in an uncontrolled setting, the mixture of pollutants makes it difficult to determine either the independent or synergistic effects of ambient air pollutants.[44]

AIR QUALITY STANDARDS

STANDARDS FOR AMBIENT AIR QUALITY IN VICTORIA

Ambient air quality is measured and regulated in Victoria against a set of standards found in the State Environment Protection Policy (Ambient Air Quality) (State Ambient Air Quality standard). Victoria has adopted the air quality requirements of the National Environment Protection Council (Ambient Air Quality) Measure (National Ambient Air Quality standard), which sets national standards for the monitoring and reporting of the following six common pollutants (also known as criteria pollutants):

- carbon monoxide
- nitrogen dioxide
- photochemical oxidants – ozone
- sulphur dioxide
- lead
- particles as PM_{10}.

The State Ambient Air Quality standard also includes a separate objective for visibility reducing particles, which is not included in the national standard.

Standards for air quality are based on rigorous science, an understanding of the state of the environment, and current and future environmental risks. The Environmental Quality Objectives found within the State Ambient Air Quality standard is designed to protect against long-term chronic exposure across populations (see Figure 4.4). They are not designed for acute or emergency scenarios.[45] Standards in Victoria, Australia and internationally have evolved over time in response to changing environmental conditions, national and international standards, evidence-based research and community expectations.[46]

Figure 4.4 State Environment Protection Policy (Ambient Air Quality) standard[47]

Environmental Indicator (Pollutant)	Averaging Period	Environmental Quality Objectives	Maximum allowable exceedences within a period of 10 years
Carbon monoxide (CO) (maximum concentration)	8 hours	9.0 ppm	1 day a year
Nitrogen dioxide (NO_2) (maximum concentration)	1 hour 1 year	0.12 ppm 0.03 ppm	1 day a year none
Photochemical oxidants Ozone (O_3) (maximum concentration)	1 hour 4 hours 8 hours 8 hours	0.10 ppm 0.08 ppm 0.05 ppm 0.08 ppm	1 day a year 1 day a year 3 days a year none
Sulphur dioxide (SO_2) (maximum concentration)	1 hour 1 day 1 year	0.20 ppm 0.08 ppm 0.02 ppm	1 day a year 1 day a year none
Lead (maximum concentration)	1 year	0.50 µg/m³	none
Particles as PM_{10} (maximum concentration)	1 day	50 µg/m³	5 days a year
Visibility reducing particles (minimum visual distance)	1 hour	20 km	3 days a year

Note the last category titled 'Visibility reducing particles' is particular to Victoria. The units of measurement for the standards listed above are parts per million (ppm) by volume and micrograms per cubic metre of air (µg/m³).

ADVISORY STANDARD FOR $PM_{2.5}$

At the time of writing this report, standards for $PM_{2.5}$ were advisory at both state and national levels (see Figure 4.5).

Figure 4.5 State and National Ambient Air Quality $PM_{2.5}$ Advisory Reporting Standard[48]

Pollutant	Averaging Period	Advisory Reporting Standard	Goal
$PM_{2.5}$	1 day 1 year	25 µg/m^3 8 µg/m^3	Goal is to gather sufficient data nationally to facilitate a review of the Advisory Reporting Standards as part of the review of this Measure to commence in 2005

On 13 May 2014, the National Environment Protection Council (NEPC) published a notice in the Victorian Gazette titled 'Notice of intention to vary the National Environment Protection (Ambient Air Quality) Measure'. The notice reads:

> The National Environment Protection Council (NEPC) is a national council of Commonwealth, State and Territory Ministers. The NEPC's role is to make National Environment Protection Measures (NEPMs). NEPMs are designed to improve national consistency in environment protection outcomes.
>
> The NEPC gives notice that it intends to make a variation to the Ambient Air Quality NEPM in relation to the standards for particles. This variation will reflect latest scientific understanding and will allow for an adequate level of health protection against the impacts of particle air pollution for the Australian community.[49]

INTERNATIONAL AIR QUALITY STANDARDS FOR $PM_{2.5}$

The United States Environmental Protection Agency (US EPA) has National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. Two types of national ambient air quality standards are produced–primary and secondary standards. Primary standards provide public health protection, including protecting the health of sensitive or vulnerable populations such as asthmatics, children, and the elderly. Secondary standards provide public welfare protection, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings.[50]

The US EPA has set NAAQS for six principal pollutants that cover the same criteria pollutants included in the national and state standards. It is important to note that although the same criteria pollutants are included, the levels at which they are measured are different in some cases, as set out in Figure 4.6. Importantly, $PM_{2.5}$ is addressed under a compliance standard rather than an advisory standard. Although the current thresholds under NAAQS are not as strict as the current advisory standard set at state and national levels in Australia, they have been in force since 1997 and are continually upgraded, most recently in 2012 (see Figure 4.6).[51]

Figure 4.6 US National Ambient Air Quality Standards[52]

Pollutant		Primary / Secondary	Averaging Time	Level	Form
Carbon monoxide (CO)		Primary	8 hour	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead		Primary and secondary	Rolling 3 month average	0.15 µg/m³	Not to be exceeded
Nitrogen dioxide (NO_2)		Primary	1 hour	100 ppb	98th percentile, averaged over 3 years
		Primary and secondary	Annual	53 ppb	Annual Mean
Ozone (O_3)		Primary and secondary	8 hour	0.075 ppm	Annual fourth-highest daily maximum 8 hour concentration, averaged over 3 years
Particle pollution	$PM_{2.5}$	Primary	Annual	12 µg/m³	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m³	Annual mean, averaged over 3 years
		Primary and secondary	24 hour	35 µg/m³	98th percentile, averaged over 3 years
	PM_{10}	Primary and secondary	24 hour	150 µg/m³	Not to be exceeded more than once per year on average over 3 years
Sulphur dioxide (SO_2)		Primary	1 hour	75 ppb	99th percentile of 1 hour daily maximum concentrations, averaged over 3 years
		Secondary	3 hour	0.5 ppm	Not to be exceeded more than once per year

Units of measurement for the standards are parts per million (ppm) by volume, parts per billion (ppb) by volume, and micrograms per cubic metre of air (µg/m³).

The World Health Organisation (WHO) recognises that particulate matter, specifically $PM_{2.5}$ and PM_{10}, poses a serious risk to human health and currently has the following guidelines for particulate matter:

- $PM_{2.5}$: 10 µg/m³ annual mean; 25 µg/m³ 24-hour mean
- PM_{10}: 20 µg/m³ annual mean; 50 µg/m³ 24-hour mean.[53]

ASH

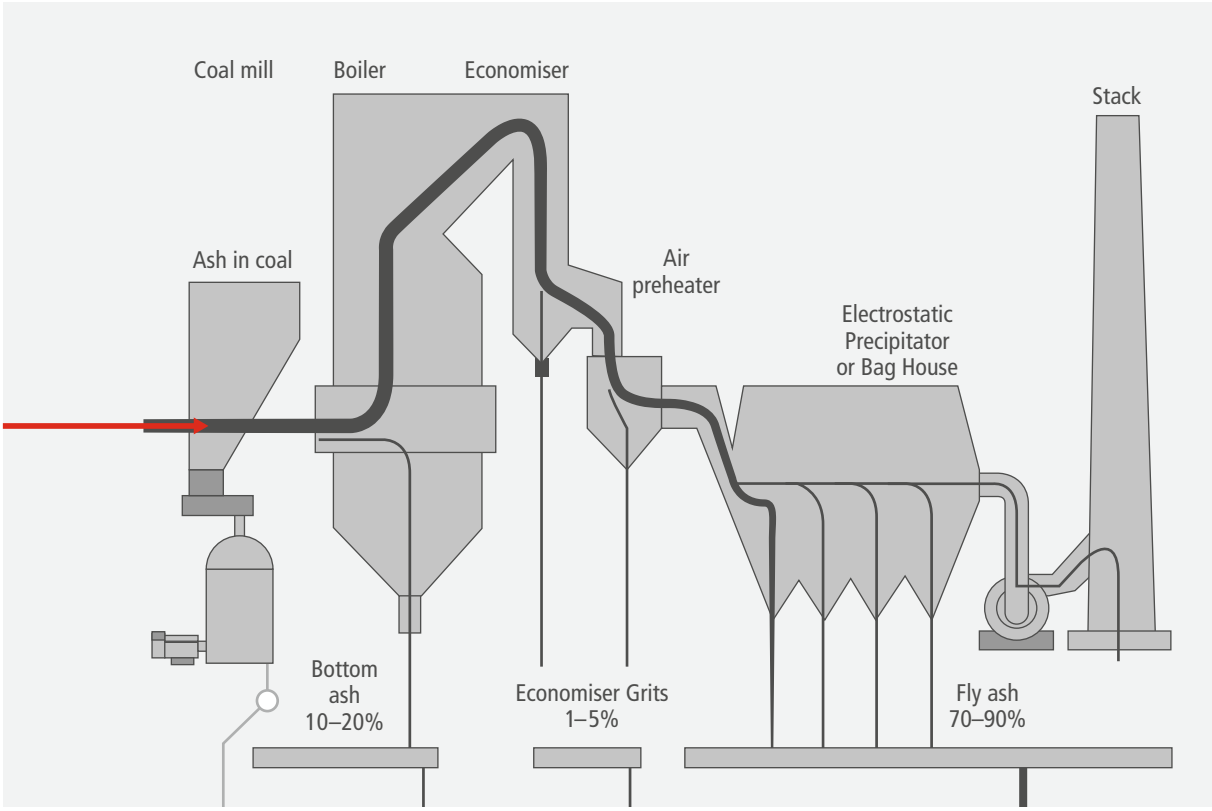
Ash is the residual or leftover material from combustion processes, including coal burning. Two types of ash are produced from industrial coal combustion processes – bottom ash and fly ash. Figure 4.7 summarises the coal combustion process in coal-fired power stations.

BOTTOM ASH AND FLY ASH

Bottom ash is the coarser residual or leftover matter found in the grate or combustion chamber once combustion has finished (for example, similar to the ash seen in a wood-fired heater in a home).

Fly ash is finer material that can be captured in gas when gas is emitted from the coal combustion process. Fly ash is captured when the exhaust gas stream passes through the pollution control system found in a combustion chamber. Depending on the efficiency of the pollution control system, a small amount of the fly ash can be released into the atmosphere.[54]

Figure 4.7 Coal combustion process in a coal-fired power station[55]



Fly ash is made up of non-flammable mineral elements that are found in raw coal. The final composition and particle size found in fly ash varies depending on a number of factors. These factors include the type of coal, the temperature of combustion, availability of oxygen, the type of combustion process and whether the coal is pre-treated prior to combustion (eg pulverised coal).[56]

ASH FROM THE HAZELWOOD MINE FIRE

An issue for the Board to consider is whether the smoke and particulate matter from the Hazelwood mine fire can be described or characterised as fly ash. Based on the data available to independent expert Ms Claire Richardson, Managing Director and Principal Consultant, Air Noise Environment Pty Ltd, the smoke and particulate matter and ash from the Hazelwood mine fire was different from particulate matter and ash caused in coal combustion during normal mine operations. This was because:

- additional sources of smoke and particulate matter from biomass burning (bushfires) were occurring at the same time as the Hazelwood mine fire
- coal combustion happened in the open air as opposed to a controlled environment such as a combustion chamber (as shown in Figure 4.7 above)
- the temperature of combustion and the variation in temperature of combustion spatially and temporally as the fire progressed was different
- the use of water and firefighting foam to quench the fire would have changed the combustion characteristics and provided an additional source of chemical constituents (eg from the additives used in the firefighting foam).[57]

Further, fly ash produced in a power station has a larger fraction of $PM_{2.5}$ and a significantly lower proportion of carbonaceous material (carbon) than the ash samples collected from areas affected by the Hazelwood mine fire.[58] Put simply, the ash produced by the Hazelwood mine fire had less carbon and $PM_{2.5}$ than fly ash.

Despite not being classified as fly ash, the ash from the Hazelwood mine fire undoubtedly caused significant distress for the community. The Department of Health advised the community that the ash was generally too large to be breathed into the lungs, but could cause irritation to the skin, eyes, nose and throat.[59]

A range of metals and organic compounds were present in the ash that was produced from the Hazelwood mine fire. If breathed in, and where the levels exceed health guidelines, there is potential for adverse health effects.[60] The potential for adverse health impacts is proportionate to the overall concentration of particulate matter inhaled, the particle size distribution and the chemical composition of the particulate matter.[61] Fortunately, the ash from the Hazelwood mine fire produced significantly less fine particles than found in fly ash (6 per cent compared to 27 per cent).[62]

WATER

The adverse impacts on water from a coal mine fire will largely come from contaminants found in ash that ends up in waterways and water tanks. Relevant contaminants are heavy metals that can settle in fish (for example) and become a part of the food chain, affecting both animals and people. Water testing and results are discussed in Chapter 4.3 Environmental effects and response.

SOIL

The impacts on soil from a coal mine fire largely come from ash deposits containing contaminants that settle on the surface and over time mix with subsurface soil. This can affect plants and vegetables grown in gardens. Soil and ash testing and results are discussed in Chapter 4.3 Environmental effects and response.

HEALTH OF THE LATROBE VALLEY

In order to fully appreciate the effects of the smoke and ash from the Hazelwood mine fire on the local community, it is important to have an understanding of the overall health of the Latrobe Valley, and in particular Morwell, prior to the mine fire.

The Department of Health conducted an investigation into the burden of disease in Victoria in 1996.[63] The term 'disease burden' refers to the loss of healthy years due to disease.

The study examined the six key health conditions suffered by communities in Victoria. The six conditions are cancer, diabetes, mental disorders, cardiovascular disease, asthma and injuries. The study showed that the Gippsland region, and in particular the Latrobe Valley, had a higher than state average of healthy years lost due to disease, as reflected in Figures 4.8 and 4.9.

Figure 4.8 Disability adjusted life year males, Gippsland region, 1996[64]

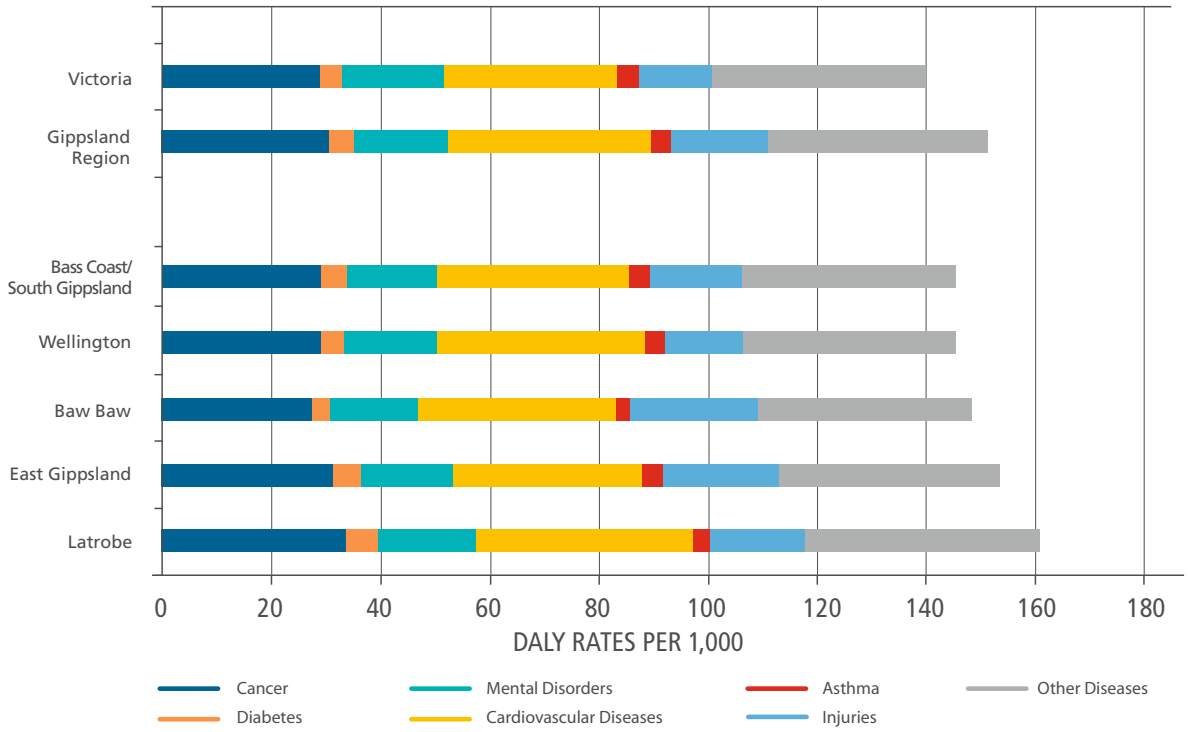


Figure 4.8 above shows the healthy years lost for males in the Gippsland region (referred to as disability adjusted life year) for the six key health conditions. The Figure demonstrates that males in the Gippsland region lose more years to disease than males in the rest of Victoria. In addition, males in the Latrobe Valley have the largest number of years lost to disease of any area of Gippsland.

Figure 4.9 Disability adjusted life year females, Gippsland region, 1996[65]

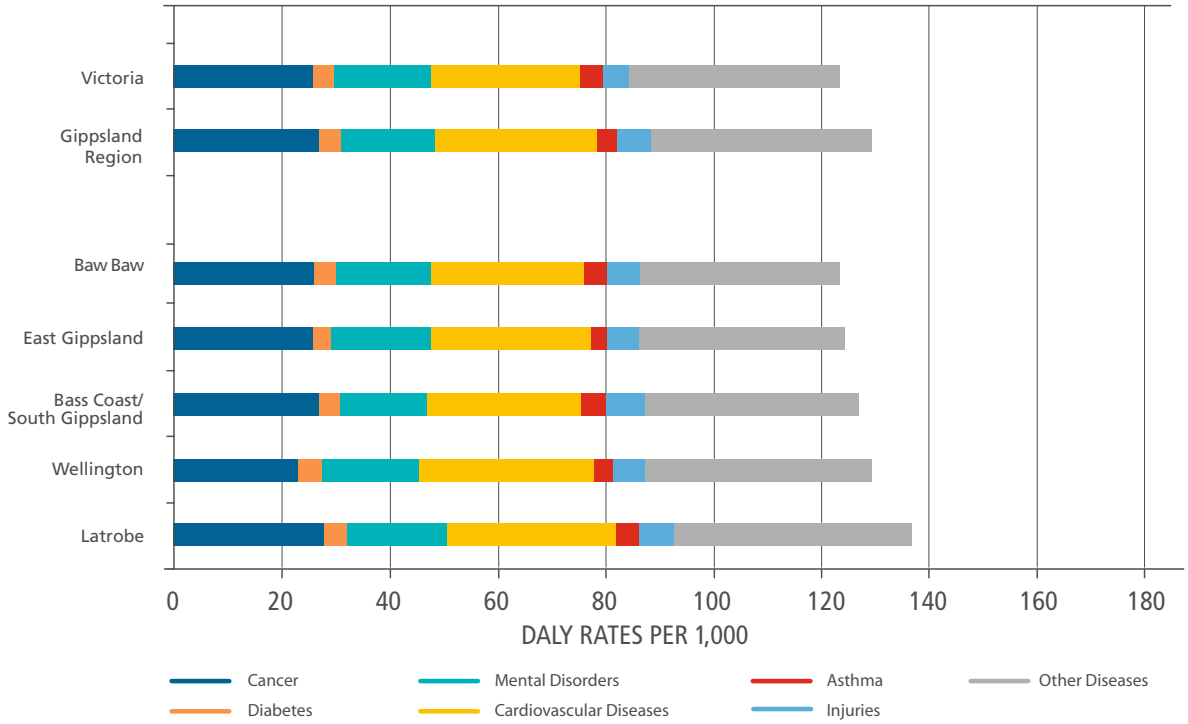


Figure 4.9 shows the healthy years lost for females in the Gippsland region (referred to as disability adjusted life year) for the six key health conditions. The Figure demonstrates that females in the Gippsland region lose more years to disease than females in the rest of Victoria. In addition, females in the Latrobe Valley have the largest number of years lost to disease of any area in Gippsland.

The Figures demonstrate that in Gippsland and the Latrobe Valley the leading causes of healthy years lost are cardiovascular diseases and cancer.

A further study demonstrated that within Gippsland, in the period 2003 to 2007, the Latrobe Valley had one of the highest rates of lung cancer and cardiovascular disease in Victoria.[66]

Figure 4.10 Lung cancer mortality in Gippsland by Local Government Area and Victoria 2003–2007[67]

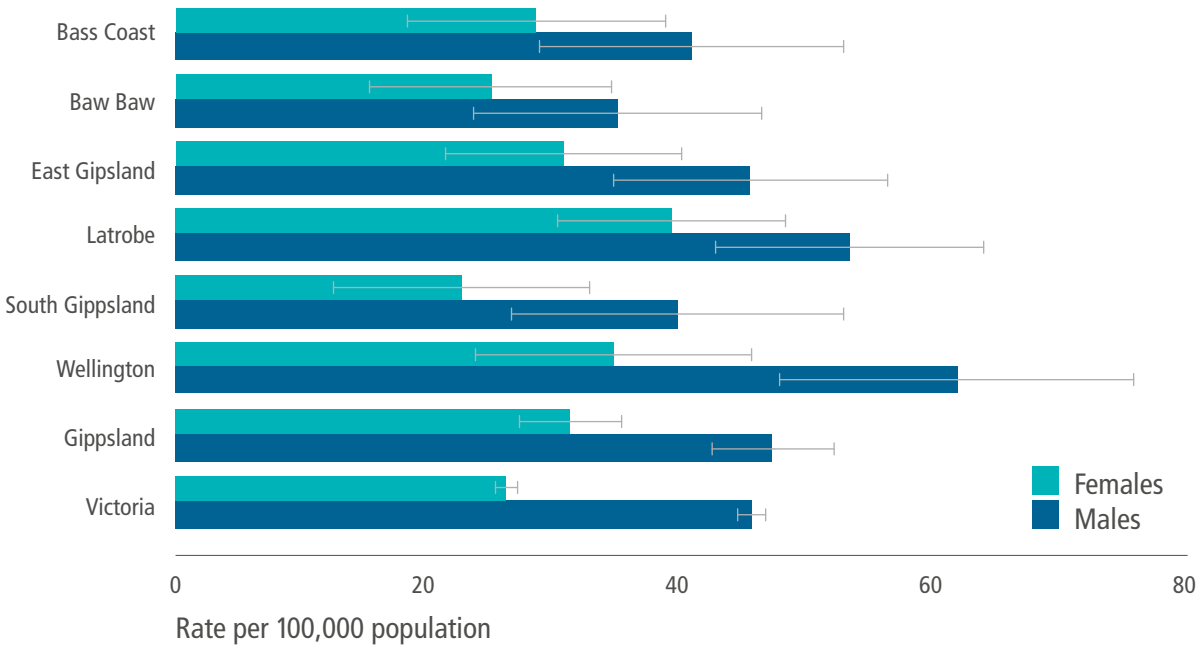


Figure 4.10 shows the deaths per 100,000 people from lung cancer during the period 2003–2007. The Figure demonstrates that the Latrobe region had the second highest rate of lung cancer mortality in Gippsland for males during this period, and the highest for females.

Figure 4.11 Cardiovascular disease mortality in Gippsland by Local Government Area and Victoria 2003–2007[68]

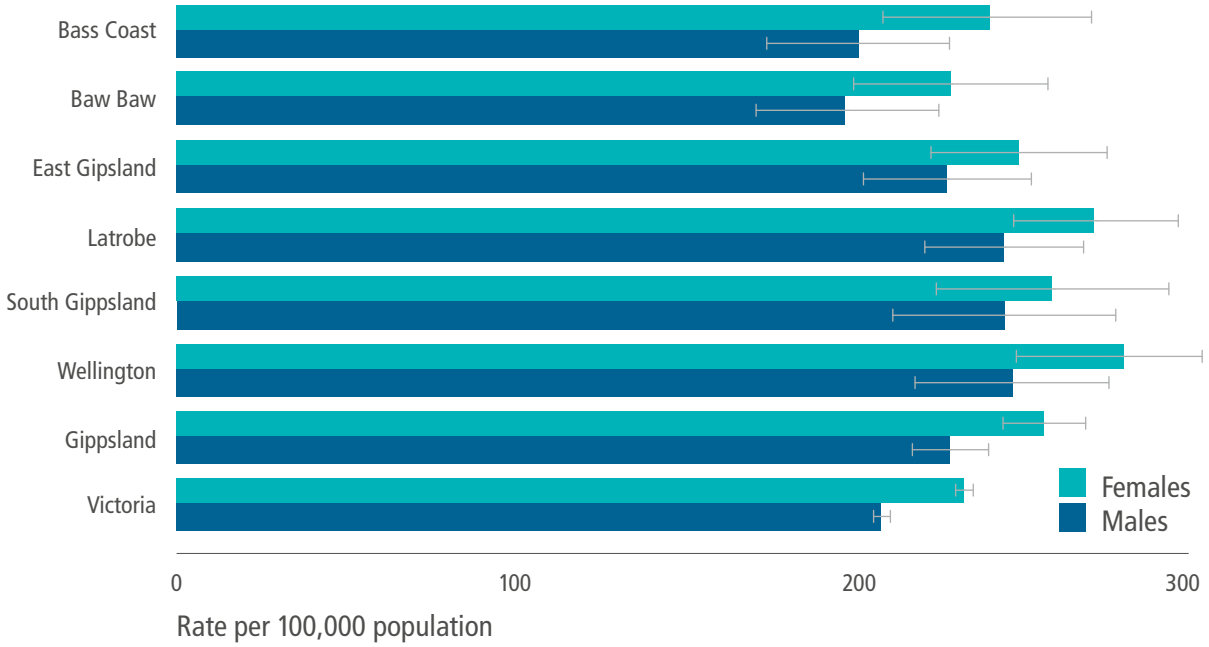


Figure 4.11 shows the deaths per 100,000 people from cardiovascular disease during the period 2003–2007. The Figure demonstrates that the Latrobe region had the second highest rate of cardiovascular disease mortality in Gippsland for males and females during this period.

The Latrobe Valley has a long history of asbestos-related disease. Asbestos was widely used in the construction of power stations in the Latrobe Valley.[69] A 2001 report found that the Latrobe Valley had the highest rates of mesothelioma of all municipalities in Victoria for the period 1986–1998 (Begg, Vos and Stone, 2001, pp. 10–12).

Ms Vicki Hamilton, Chief Executive Officer and Secretary of the Asbestos Council of Victoria and the Gippsland Asbestos Related Diseases Support Inc., told the Board that the Latrobe Valley and Gippsland have seven times the rate of mesothelioma relative to the Victorian average, and that for every case of mesothelioma there are two to three asbestos–related lung cancers, and up to eight cases of asbestos–related disease in the community.[70] Ms Hamilton described to the Board the devastating effects of asbestos disease for affected individuals, their families and the community.

In addition to its disadvantaged health status, the population of the Latrobe Valley also faces a number of social and economic challenges.

Key health and social indicators for the Latrobe Valley are outlined in Figure 4.12 below.

Figure 4.12 Key health and social indicators for the Latrobe Valley[71]

Health/social indicator	Latrobe Valley	Victoria
Life expectancy (male)	75.7 years	79.6 years
Life expectancy (female)	81.5 years	84.3 years
DALY (male)	169.8	143
DALY (female)	138	129.1
YLD (male)	80.2	71.7
YLD (female)	80.7	71.4
Emergency department presentations per 1,000 population	328.7	226.8
Mental health contacts per 1,000 population	513.4	353.1
Community health occasions of service per 1,000 population	397.4	105.1
SEIFA (IRSED) rank	6	
GP's per 1,000 population	1.3	1.5
Unemployment rate	6.5%	5.4%
Percentage of individuals with income less than $400 per week	45.2%	39.9%
Median household income	$942	$1,216

DALY – Disability adjusted life year combines a measurement of premature mortality and disability. A high DALY rate indicates poor health status of a population. A low DALY rate reflects better health.

YLD – Years lived with a disability includes what is disabling people or causing ill health. A high YLD indicates poor health status of the population. A low YLD rate reflects better health.

SEIFA (IRSED) is an index to measure the relative socioeconomic disadvantage of geographical areas, based on a range of Census variables considered to reflect disadvantage, including low income, unemployed and lack of educational attainment. 1 = most disadvantaged; 79 = least disadvantaged.

MORWELL

Morwell is the closest populated area to the Hazelwood mine and is one of the most disadvantaged towns in Victoria.[72]

Morwell is an ageing community. The average age of a Morwell resident is 38 years, and 16.6 per cent of the population is aged 65 years or over. Compared to the rest of Victoria, Morwell has a lower percentage of adults aged between 25 and 49 years, and a higher percentage of adults aged over 50 years.[73]

The most common ancestries in Morwell are Australian (28.7 per cent), English (27.9 per cent), Scottish (7.6 per cent), Irish (7 per cent) and Italian (4.5 per cent). The majority of residents in Morwell were born in Australia (77.4 per cent). In 85.1 per cent of households, English is the only language spoken at home. Other languages spoken at home include Italian (2.6 per cent), Mandarin (0.8 per cent), Greek (0.6 per cent), Arabic (0.5 per cent) and German (0.5 per cent) (Australian Bureau of Statistics, 2011 Census).

A high proportion of Morwell residents require assistance in their day-to-day lives due to disability.[74]

In the area of Morwell south of Commercial Road, 24.6 per cent of the population are aged over 65 years. This is greater than the proportion in regional Victoria (17.5 per cent) and Victoria as a whole (14.2 per cent).[75] 10.6 per cent of the community in this area need assistance due to a disability, a long-term health condition, or old age.[76]

The number of young children in the south of Morwell is lower than the regional and state average—4.7 per cent compared to 6.3 per cent (regional Victoria) and 6.4 per cent (Victoria).[77]

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10. Exhibit 32 – Statement of John Merritt, para. 40
11. Exhibit 39 – Expert report of Claire Richardson, para. 23
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4.2 CHRONOLOGY OF EVENTS

OVERVIEW

This Chapter provides a chronology of key events during the Hazelwood mine fire, relevant to the environmental and health management of the emergency and its impact on the local community.

Under its Terms of Reference, the Board of Inquiry is required to investigate and report on the measures taken by GDF Suez, emergency services, and other relevant government agencies in respect of the health and wellbeing of communities affected by the Hazelwood mine fire. This Chapter provides a summary of those measures. A more detailed discussion of the measures taken in respect of the community's health and wellbeing can be found in following chapters.

From 9 February 2014 until 25 March 2014, the local community was overwhelmed by smoke and ash from the Hazelwood mine fire.

As discussed in earlier chapters, the Country Fire Authority managed the response to the fire. The Environment Protection Authority, the Department of Health, the Department of Human Services, and the Department of Education and Early Childhood Development together with the Latrobe City Council, responded to the fire's health and environmental impacts and led recovery efforts.

The Environment Protection Authority and the Department of Health were the key agencies responsible for providing the community with information about smoke and ash produced by the mine fire and possible adverse health effects. The Department of Health (with the assistance of the Department of Human Services) set up a number of initiatives to provide respite and relief for the community throughout the fire.

To understand the sequence of events relevant to the management of the Hazelwood mine fire's impact on the community, the Board of Inquiry heard evidence from key representatives from each relevant government department and agency, and also heard from a number of members of the local community.

WEEK ONE: 9/10 FEBRUARY 2014 – 16 FEBRUARY 2014

On the evening of 9 February 2014, Morwell was surrounded by a number of fires, including bushfires and the Hazelwood mine fire.

On the evening of 9 February 2014, the Latrobe City Council made a decision to close all preschools and maternal and child health centres in the Council area for the following day due to the fires in the area. The Carinya Early Learning Centre was also closed because it comprises a preschool as well as an early learning centre.[1] All services reopened on 11 February 2014, except for the Maryvale Crescent Preschool in Morwell, which remained closed.[2] The Maryvale Crescent Preschool was treated differently to other preschools because it was very close to the mine fire. After a period of closure on 24 February 2014, the Maryvale Crescent Preschool was relocated to Moe.[3] The centres that were reopened were advised to run indoor programs and monitor the fire-related conditions.[4]

The fires caused a distressing amount of smoke in the community as illustrated in Figure 4.13. Ms Lisa Wilson, Gippsland Homeless Network Coordinator at Quantum, described being confronted by 'very smoky and gritty air' when she returned to Morwell from holidays on 10 February 2014.[5]

Figure 4.13 Morwell on 9 February 2014

Image source *Newspix/News Ltd*

On 11 February 2014, in response to a request from the State Control Centre, the Environment Protection Authority (EPA) established an extensive air monitoring program in order to understand the environmental consequences of the Hazelwood mine fire. Data collected through this program was provided to the Department of Health over the course of the event so that the Chief Health Officer could make health assessments and provide advice both to the State Control Centre and to the community.[6]

On the same day as the EPA was officially engaged as a support agency, Dr Paul Torre was designated as its primary Science Officer. His role was to provide scientific support in response to the mine fire. This function was rotated between other scientists from the EPA.[7]

Dr Torre and the air monitoring team from the EPA determined that air quality monitoring was required immediately. This assessment was based on a number of factors, including poor air quality already registered due to the fires in Gippsland, and satellite images and reports of the Hazelwood incident. Dr Torre determined that monitoring particulate matter (by capturing $PM_{2.5}$) was a priority. The EPA did this by recommissioning the air monitoring station in Hourigan Road in the eastern part of Morwell. This monitoring station was originally set up to monitor air quality, and so was the most readily available monitoring station to activate in Morwell.[8] The station was up and running and capturing data by the end of Wednesday 12 February 2014.

Also on 11 February 2014, the EPA issued a low level smoke advisory due to smoke in the area from the fires.[9] The smoke advisory was generated pursuant to the joint EPA and Department of Health Bushfire Smoke Protocol and did not contain any specific information about adverse health risks from a coal mine fire as opposed to a bushfire.

Late in the evening on 11 February 2014, the Incident Controller suspended firefighting in the mine after a report that several firefighters had presented to hospital.[10]

During the first week of the mine fire, local community organisations and St Vincent de Paul distributed face masks to some members of the community.[11] Ms Tracie Lund, Morwell Neighbourhood House Coordinator, stated to the Board that at this time '…there was a lot of smoke in the air, and we were choking in it'.[12]

On 12 February 2014, Mr Craig Lapsley, Services Commissioner, advised a State Emergency Management Team meeting that the Hazelwood mine fire could burn for at least a month.[13] At this meeting, the Department of Education and Early Childhood Development (DEECD) raised the issue of air quality and the potential impact on schools and children's services close to the mine.[14] Mr Nicholas Pole, Deputy Secretary, Regional Services Group, from DEECD stated to the Board that DEECD was concerned that smoke from the fire was impacting on the quality of the air in schools and childcare facilities.[15]

Also on 12 February 2014, Dr Torre travelled to the mine site in order to conduct a full assessment of what was required in terms of air quality monitoring. While near the mine site, the Country Fire Authority (CFA) advised Dr Torre of carbon monoxide readings coming from the mine. Dr Torre instructed EPA staff to hire hand-held carbon monoxide monitors and to identify portable carbon monoxide monitoring equipment. Both the CFA and EPA conducted initial monitoring of carbon monoxide, with low cost monitoring devices from 12 February 2014.[16]

The EPA also determined that additional air quality monitoring was required in the community. In the absence of a permanent monitoring station near the mine (such as those in Traralgon and Hourigan Road in Morwell, which take weeks to build), the EPA set about identifying air monitoring equipment that would capture particulate matter near the residential area closest to the mine. The EPA hired portable particulate matter monitors also known as DustTrak monitors that give indicative readings of $PM_{2.5}$.[17]

During the first week of the mine fire, the EPA was unable to provide the Department of Health with validated rolling averages for carbon monoxide and $PM_{2.5}$ levels. However, the Department of Health did have access to indicative data from the EPA together with the Department of Health's own general observations about visibility in the area.[18]

On 13 February 2014, Dr Torre determined that the Morwell Bowling Club at 52 Hazelwood Road would be a suitable location for an additional fixed monitoring site as it was both within the township and as close to the mine site as possible. This decision was taken in consultation with the EPA Incident Commander. On the same day, a portable DustTrak monitor was installed at the Morwell Bowling Club and monitoring of $PM_{2.5}$ commenced at this site.[19]

Dr Rosemary Lester, Chief Health Officer, told the Board that the initial health response to the Hazelwood mine fire was focused on the smoke emitted from the surrounding bushfires, not the fire in the coal mine.[20] Dr Lester stated that '[g]iven that we know that bushfire smoke can have acute health effects on health… then we need to get the message out from the start as to what people need to do to protect their health.'[21]

On 13 February 2014, four days after the mine fire commenced, Dr Lester issued the first health alert.[22] In this alert, Dr Lester advised that high levels of smoke can aggravate existing heart or lung conditions and cause irritated eyes, coughing or wheezing. She also advised that children, the elderly, smokers and people with pre-existing illnesses (such as heart and lung conditions) are more sensitive to the effects of breathing fine particles ($PM_{2.5}$). Her advice was to avoid prolonged or heavy physical activity outdoors.[23] The same day, Mr Lapsley determined that the mine fire should have a HazMat (hazardous materials and items) overlay applied.[24]

On 13 and 14 February 2014, the EPA commenced monitoring carbon monoxide in the community using hand-held monitors at schools, aged care facilities and childcare centres. No significantly elevated readings were obtained.[25]

On 14 February 2014, the Incident Controller released the Health Management and Decontamination Plan to provide protection to firefighters against exposure to carbon monoxide.[26]

The Incident Controller arranged a community meeting on 14 February 2014. At this meeting the Department of Health distributed a fact sheet on the health effects of the Hazelwood mine fire, which included information about the smoke that was being produced, the production of carbon monoxide, potential short-term and long-term health effects, and general advice to the community. The information sheet also stated that '[d]uring extended, very smoky conditions, sensitive individuals should consider temporarily staying with a friend or relative living outside the smoke-affected area.'[27]

At approximately midday on 15 February 2014, CFA HazMat technicians recorded elevated readings of carbon monoxide in the Morwell community.[28] The carbon monoxide spot readings were elevated in and around Morwell, south of Commercial Road, in particular at the Morwell Police Station where levels reached 20 ppm.[29] A meeting was promptly held between the Incident Controller, Scientific Advisor and the Public Information Officer, who agreed that a 'shelter in place' warning should be issued to local residents in the affected area.[30] Dr Lester was advised of the intended notification and said that the Department of Health would provide a risk assessment to the Incident Controller.[31] However, unfortunately this was not provided until after the alert was issued.

At approximately 1 pm, the CFA sent the following message to a number of Morwell residents (based on their proximity to the mine fire): 'Watch and Act – Morwell residents indoors immediately, close windows/doors/vents. Seek further info via radio.'[32]

The Department of Health was not involved in the final decision to issue the 'Watch and Act' alert.[33] Dr Lester advised the Board that she did not agree with the 'Watch and Act' alert and considered that it was unhelpful as it sent a very concerning message to the community that was not necessary.[34]

Later that afternoon there was an easterly wind change, which dispersed the carbon monoxide.[35] The 'Watch and Act' alert was downgraded at around 6.45 pm and residents were sent a further text message, which stated: 'Watch and Act – can go outside and open doors and windows.'[36]

After the first week of the fire, the Department of Health recognised that new decision-making tools beyond the Bushfire Smoke Protocol were required to inform public health advice.[37] On 15 February 2014 the EPA and Department of Health commenced work on a carbon monoxide protocol to provide guidance to officials and the community about elevated levels of carbon monoxide.[38]

At around this time the Department of Health began issuing additional alerts and community information sheets with information about the potential adverse health effects of the fires. Low and high level advisories pursuant to the Bushfire Smoke Protocol continued to be issued by the EPA for the duration of the Hazelwood mine fire.[39]

The EPA provided summaries of indicative data of $PM_{2.5}$ to the Department of Health and the Regional Control Centre from 16 February 2014.[40]

On the weekend of 15 and 16 February 2014, high indicative carbon monoxide readings were observed.[41]

Dr Torre told the Board that on 16 February 2014, the visibility in Morwell was less than one kilometre and that the level of smoke was unprecedented and unexpected.[42] In his statement to the Board he stated that there was a noticeable decline in air quality with visibility down to between 300 and 500 metres.[43] When asked by the Board what he would estimate the levels of $PM_{2.5}$ to have been at that time against the air quality standard of 25 $\mu g/m^3$, Dr Torre stated that 'I think we're estimating could be 500, 700, it's very high.'[44]

On 16 February 2014, the CFA recorded elevated spot readings of carbon monoxide in the community–around 20–30 ppm with a peak of 60 ppm.[45] Later that evening, Dr Torre advised the Department of Health that the EPA had also recorded elevated carbon monoxide and $PM_{2.5}$ readings.[46] The Department of Health determined that no action was required that night.[47]

WEEK TWO: 17 FEBRUARY 2014 – 23 FEBRUARY 2014

On 17 February 2014, Dr Lester updated her community health alert to include pregnant women in the 'at risk' group. Dr Lester told the Board that she included pregnant women due to evidence that lower birth weight of babies may occur where the mother is exposed to fine particles over a sustained period.[48]

Following the very poor air quality on the weekend of 15 February 2014 and 16 February 2014, a community meeting was held at Kernot Hall, Morwell on 18 February 2014. At this meeting the community expressed anger and some members of the community felt that the meeting was not well managed.[49] In her evidence to the Board, Ms Merita Tabain, Chair of the Emergency Management Joint Public Information Committee (EMJPIC), stated that there were not enough government representatives present who were senior enough to give a definitive answer.[50] Mr Lapsley advised the Board that this meeting 'was a turning point and highlighted to the emergency management agencies the depth of concern within the Morwell community about the mine fire and the potential effects of the smoke.'[51]

The Morwell Neighbourhood House also commenced community meetings to provide the local community with up-to-date information about the fire.[52]

Mr Pole stated to the Board that on 18 February 2014, DEECD commenced planning the possible relocation of schools and children's services (early learning centres, kindergartens and outside school hours care programs) following communication with Dr Lester.[53] DEECD informed Dr Lester that a report had been received from a children's service of children exhibiting hyperactivity, headaches, flushed faces and longer sleep times. Dr Lester advised that the symptoms were consistent with smoke exposure and that schools and children's services south of Commercial Road (nearest to the mine) should be temporarily relocated out of the smoke.[54] The same day DEECD resolved to undertake air monitoring at all schools and children's services in Morwell. The monitoring was conducted with hand-held devices and measured carbon monoxide, carbon dioxide and PM_{10}.[55]

On 18 February 2014, carbon monoxide and sulphur dioxide monitors were installed by the EPA at Hourigan Road, Morwell (East),[56] and ash samples were taken by the EPA in Morwell and sent for analysis.[57]

From 19 February 2014, the Department of Health began to obtain validated data from the EPA on carbon monoxide levels (eight hour rolling averages) from the station in the east of Morwell. On this same day, the EPA provided its first regular data summary of $PM_{2.5}$ to the Department of Health and the Chief Health Officer. By this time the EPA had transported a mobile air monitoring device (MoLab) to the Morwell Bowling Club and commenced logging air monitoring data, including for carbon monoxide and $PM_{2.5}$.[58]

On 19 February 2014, the Department of Health contacted local general practitioners to discuss any increase in demand they had observed during the Hazelwood mine fire.[59]

Also on 19 February 2014, a community respite centre was established in Moe to provide an area for people to seek relief from the smoky conditions. The centre offered psychosocial support (via the Red Cross), fire information (through the CFA and Victoria Police), health and environment information (from Ambulance Victoria and the EPA), child friendly spaces, and tea, coffee and snacks.[60] The Latrobe City Council provided a free bus service from Morwell to the centre and also offered to provide taxi vouchers to some residents to enable them to attend the centre.[61]

The two schools closest to the mine, Commercial Road Primary School and Sacred Heart Primary School, were relocated on 20 February 2014.[62]

The Department of Human Services (DHS) recognised that some residents were experiencing personal hardship as a result of the Hazelwood mine fire. In response to this, respite payments of $500 per household (with a payment of up to $1,250 per household in exceptional circumstances) were made available on 21 February 2014.[63]

On 21 February 2014, the Department of Health established the health assessment centre at the Ambulance Victoria Regional Office, 2 Saskia Way, Morwell.[64] Ms Wilson stated to the Board that she attended the health assessment centre regularly to assess her health and the health of her unborn baby, in conjunction with regular consultations with her general practitioner.[65]

On 21 February 2014, the EPA launched a dedicated microsite web page for the Latrobe Valley and the Hazelwood mine fire on its website.[66]

Between 21 February 2014 and 24 February 2014, the $PM_{2.5}$ levels recorded at the monitoring station at the Morwell Bowling Club (South) exceeded the high (extreme) level (greater than 250 µg/m^3).[67]

On 22 February 2014 and 23 February 2014, the carbon monoxide levels recorded at the monitoring station at the Morwell Bowling Club (South) were classified as poor or very poor (greater than 9 ppm).[68]

WEEK THREE: 24 FEBRUARY 2014 – 2 MARCH 2014

On 24 February 2014, the Department of Health issued a number of further health alerts and information sheets for the community about the use of rainwater, cleaning and face masks. The alerts were published online and distributed via traditional media.[69]

In these alerts, the Department of Health advised that ordinary paper dust masks, handkerchiefs and bandanas did not filter out fine particles ($PM_{2.5}$) and were generally not helpful in protecting the lungs. Special P2 face masks (available at hardware stores) provided superior filtering of fine particles but did not protect against gases contained in the smoke, such as carbon monoxide. The Department of Health further advised that unless face masks had a good seal, they would not offer suitable protection. People with existing heart and lung conditions were advised to seek medical advice before using a face mask.

On 25 February 2014, Dr Lester advised that community members in 'at risk' groups should consider temporarily staying outside the smoke affected area, that other community members should consider a break away from the smoke and that outdoor activity should be avoided.[70] The same day, the Department of Health established a website specific to the Hazelwood mine fire.[71]

On 26 February 2014, the Latrobe City Council decided to close all preschools in Morwell and the Carinya Early Learning Centre. Mr John Mitchell, Acting Chief Executive Officer of Latrobe City Council, stated to the Board that the decision was made because it became clear that children were frustrated at remaining inside and some were becoming affected by smoke filtering through the doors and vents.[72] By 27 February 2014, all government run children's services had closed or announced their intention to close shortly.[73]

On 26 February 2014 and 27 February 2014 there was a significant decrease in air quality triggering the $PM_{2.5}$ Health Protection Protocol which had recently been developed by the Department of Health and the EPA. On 27 February 2014, the $PM_{2.5}$ levels recorded at the monitoring station at the Morwell Bowling Club (South) exceeded the high (extreme) level (greater than 250µg/m^3).[74] Carbon monoxide levels were also classified as very poor (greater than 9 ppm).[75]

On the morning of 28 February 2014, Dr Lester met with Mr Ken Lay, Chief Commissioner of Police, Mr Lapsley, Mr John Merritt, former Chief Executive Officer of the EPA, and Mr Mitchell, to discuss the proposed relocation advice.[76] The parties supported Dr Lester's recommendation that 'at risk' residents in Morwell who lived south of Commercial Road should consider relocating.

On 28 February 2014, Dr Lester advised that residents who were over 65 years of age, preschool aged children, pregnant women and anyone with a pre-existing respiratory or cardiovascular condition located in Morwell south of Commercial Road should temporarily relocate from the area.[77] This advice coincided with the announcement of a relocation payment from DHS.

WEEKS FOUR TO TWELVE: 3 MARCH 2014 – 28 APRIL 2014

From 7 March 2014, DHS made a second respite payment of $500 available.[78] The same eligibility criteria that applied to the first payment also applied to this payment. DHS also made second and third relocation payments available on 7 and 14 March 2014.[79]

Dr Lester lifted the relocation advice on 17 March 2014.[80] All children's services and maternal and child health centres resumed normal operations on 24 March 2014.[81] By the start of Term 2 on 22 April 2014, all schools and children's services in Morwell had been cleaned and staff and students had returned.[82]

The Department of Health has committed to a long-term health study into the potential adverse health effects suffered by those affected by the Hazelwood mine fire. Dr Lester advised that the study would be conducted by an independent body and would consider the potential health impacts of the mine fire on heart and lung disease, cancers, mental health and birth weight of babies.[83]

1. Exhibit 55 – Statement of John Mitchell, para. 17
2. Exhibit 55 – Statement of John Mitchell, para. 20
3. Exhibit 55 – Statement of John Mitchell, para. 30
4. Exhibit 55 – Statement of John Mitchell, para. 21
5. Wilson T1934:21– 28
6. Exhibit 32 – Statement of John Merritt, paras 8 & 32
7. Exhibit 32 – Statement of John Merritt, para. 9; Exhibit 38 – Second statement of Paul Torre, para. 3
8. Exhibit 38 – Second statement of Paul Torre, para. 8
9. Environment Protection Authority Victoria 2014 , *February 2014 News and Updates*, EPA, Melbourne, viewed 21 July 2014, http://www.epa.vic.gov.au/latrobe-valley-mine-fire/news-and-updates-on-the-hazelwood-mine-fire/february-2014
10. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 14
11. Exhibit 30 – Statement of Tracie Lund, para. 26
12. Exhibit 30 – Statement of Tracie Lund, para. 11
13. Lapsley T52:9-12; Exhibit 3 – Situation report for the State Control Centre for 12 February 2014, p. 3
14. Exhibit 36 – Statement of Nicholas Pole, para. 82
15. Pole T903:25-31
16. Exhibit 38 – Second statement of Paul Torre, paras 12-14
17. Exhibit 38 – Second statement of Paul Torre, paras 9 & 13
18. Exhibit 32 – Statement of John Merritt, para. 122; Exhibit 46 – Statement of Rosemary Lester, paras 54 & 58; Lester T1163:4-22; T1217:15 – T1218:15
19. Exhibit 38 – Second statement of Paul Torre, paras 18,19 & 22
20. Exhibit 46 – Statement of Rosemary Lester, para. 41
21. Lester T1125:25-28
22. Exhibit 46 – Statement of Rosemary Lester, para. 71
23. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.001.0011)
24. Exhibit 1 – Statement of Craig Lapsley, para. 128
25. Exhibit 38 – Second statement of Paul Torre, paras 23 & 30
26. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 19
27. Exhibit 46 – Statement of Rosemary Lester, attachment 7
28. Exhibit 21 – Statement of Costa Katsikis, para. 20
29. Katsikis T539:14-19
30. Exhibit 21 – Statement of Costa Katsikis, para. 20
31. Lester T1152:4-28
32. Exhibit 54 – Statement of Brooke Burke, para. 22
33. Lester 1152:4-28
34. Lester T1154:10-13
35. Exhibit 18 – Statement of Simon Bloink, para. 19
36. Exhibit 54 – Statement of Brooke Burke, para. 26
37. Exhibit 46 – Statement of Rosemary Lester, para. 49
38. Exhibit 38 – Statement of Paul Torre, para. 36; Exhibit 46 – Statement of Rosemary Lester, paras 55 & 56
39. Exhibit 46 – Statement of Rosemary Lester, attachment 18
40. Exhibit 32 – Statement of John Merritt, para. 122
41. Exhibit 32 – Statement of John Merritt, para. 132
42. Torre T974:24 – T975:6
43. Exhibit 38 – Second statement of Paul Torre, para. 40
44. Torre T976:14-17
45. Exhibit 21 – Statement of Costa Katsikis, para. 26
46. Exhibit 47 – Email from Vikki Lynch dated 16 February 2014
47. Lester T1162:13-23; Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.001.0009)
48. Exhibit 46 – Statement of Rosemary Lester, paras 40.4 & 71(c)
49. Exhibit 71 – Statement of Robert Jackman, para. 12
50. Exhibit 53 – Statement of Merita Tabain, para. 111
51. Exhibit 1 – Statement of Craig Lapsley, paras 165 & 166
52. Exhibit 30 – Statement of Tracie Lund, paras 15 & 19
53. Exhibit 36 – Statement of Nicholas Pole, para. 51
54. Exhibit 36 – Statement of Nicholas Pole, para. 87; attachment 45
55. Exhibit 36 – Statement of Nicholas Pole, paras 96 & 97
56. Exhibit 38 – Second statement of Paul Torre, para. 49
57. Exhibit 38 – Second statement of Paul Torre, para. 50
58. Exhibit 38 – Second statement of Paul Torre, para. 51

59. Exhibit 44 – Statement of Christopher Brook, paras 553 & 554
60. Written submission of the Victorian Government, 22 May 2014, para. 10.22; Exhibit 72 – Statement of Lance King, paras 50, 51, 55 & 56
61. Exhibit 72 – Statement of Lance King, para. 54
62. Exhibit 36 – Statement of Nicholas Pole, para. 52
63. Exhibit 56 – Statement of Alan Hall, paras 111 & 112
64. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.003.0005)
65. Exhibit 87 – Statement of Lisa Wilson, paras 17-20
66. Exhibit 32 – Statement of John Merritt, para. 185(a)
67. Exhibit 46 – Statement of Rosemary Lester, attachment 14
68. Exhibit 46 – Statement of Rosemary Lester, attachment 10
69. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.002.0029; DOH.0001.002.0011; DOH.0001.002.0021)
70. Exhibit 46 – Statement of Rosemary Lester, para. 71(d)
71. Exhibit 46 – Statement of Rosemary Lester, para. 80
72. Exhibit 55 – Statement of John Mitchell, paras 22-25
73. Exhibit 36 – Statement of Nicholas Pole, para. 53
74. Exhibit 46 – Statement of Rosemary Lester, attachment 14
75. Exhibit 46 – Statement of Rosemary Lester, attachment 10
76. Mitchell T1433:31 – T1434:21; T1434:25 – T1435:5
77. Exhibit 46 – Statement of Rosemary Lester, para. 87; Exhibit 56 – Statement of Alan Hall, paras 80 & 81
78. Exhibit 56 – Statement of Alan Hall, para. 125
79. Exhibit 56 – Statement of Alan Hall, para. 93
80. Exhibit 36 – Statement of Nicholas Pole, para. 58
81. Exhibit 55 – Statement of John Mitchell, para. 39
82. Exhibit 36 – Statement of Nicholas Pole, para. 59
83. Exhibit 46 – Statement of Rosemary Lester, paras 92-95

4.3 ENVIRONMENTAL EFFECTS AND RESPONSE

OVERVIEW

This Chapter examines the role of the Environment Protection Authority in its capacity as a support agency during the Hazelwood mine fire.

Under its Terms of Reference, the Board of Inquiry is required to investigate and report on the adequacy and effectiveness of the response to the mine fire by environmental agencies, in particular in respect to the health and wellbeing of the affected communities.

The Environment Protection Authority is Victoria's environmental regulator. For the last three decades the Environment Protection Authority has monitored air quality in the Latrobe Valley via a permanent air monitoring station in Traralgon.

During the Hazelwood mine fire, the Environment Protection Authority conducted air quality monitoring in Morwell and the surrounding areas on a significant scale. On 11 February 2014, the State Control Centre made a request to the Environment Protection Authority, that they provide support and advice in responding to the Hazelwood mine fire. A variety of equipment was used at different locations to obtain relevant data. Data on air quality was then provided to the Department of Health to help inform its advice to the community. The Environment Protection Authority also tested soil, ash and water during the mine fire.

Environmental testing demonstrated that there were three key time periods of significantly elevated levels of pollution (primarily $PM_{2.5}$ and carbon monoxide). These time periods were 15–18 February 2014, 21–25 February 2014, and 26–28 February 2014. During these periods $PM_{2.5}$ levels were well above the advisory standard. A peak reading of $PM_{2.5}$ was estimated for 16 February 2014 when the daily average was approximately 700 ppm–approximately 28 times the advisory standard of 25 ppm. Carbon monoxide levels were also significantly elevated during the three peak periods. The maximum daily eight hour average of carbon monoxide was recorded on 16 February 2014 at 33 ppm–almost four times the compliance standard of 9 ppm.

Other pollutants, such as sulphur dioxide, nitrogen dioxide and ozone, were recorded during the mine fire; but they did not exceed compliance standards. The Environment Protection Authority also monitored volatile organic compounds. It found that benzene exceeded the assessment criteria of 9 ppb at the Morwell Bowling Club (South) on two occasions (when it was recorded at 14 ppb and 9.7 ppb), and on one occasion at the Maryvale Crescent Preschool (when it was recorded at 9.2 ppb). Children were not at the facility at this time.

The Board of Inquiry heard from Dr Paul Torre, Science Officer at the Environment Protection Authority, and expert witness Ms Claire Richardson, Managing Director and Principal Consultant, Air Noise Environment Pty Ltd, about the air, water and soil quality monitoring conducted during the Hazelwood mine fire.

The Board commends the Environment Protection Authority for:

- its commitment to scientific rigour and scientific competence in analysing a large amount of complex air quality data sets in a short period of time
- working assiduously to overcome equipment deficiencies, and moving as swiftly as it could to obtain equipment from wherever it could
- the monitoring conducted from 20 February 2014 onwards at the Morwell Bowling Club (South)
- seeking independent peer reviews about its response to the Hazelwood mine fire.

Based on the evidence available, the Board finds that limited equipment and resources delayed the ability of the Environment Protection Authority to provide indicative and validated data to the Department of Health and the community in a timely way. Further, the Environment Protection Authority was overly focused on validated data, when indicative data would have sufficed for decision-makers during the emergency.

ENVIRONMENT PROTECTION AUTHORITY

The Environment Protection Authority (EPA) is Victoria's environmental regulator.[1] It is a statutory authority established under the *Environment Protection Act 1970* (Vic) (Environment Protection Act).[2] The EPA's role is one of both prevention and response relevant to reducing the harmful effects caused to the environment by pollution.[3]

The EPA provides expert advice to emergency services. The EPA is called on regularly to respond to pollution incidents, such as industrial spills, and natural disasters, such as floods.[4] During bushfire season, the EPA provides advice and forecasting on the impacts of bushfire smoke.[5]

The EPA also monitors compliance with the Environment Protection Act.[6] In line with current international regulatory practice, the EPA adopts a 'risk based' regulatory approach. This means that it allocates resources where the greatest difference can be made regarding potential harm to the environment and the likelihood of non-compliance.[7]

EPA IN THE LATROBE VALLEY

HISTORY OF THE EPA IN THE LATROBE VALLEY

The EPA has monitored air quality in the Latrobe Valley over the last three decades.[8]

The EPA has 14 permanent monitoring stations (also known as reference stations) located in Victoria. One of these permanent monitoring stations is located in Traralgon. This is the only permanent station in Victoria located outside the Melbourne metropolitan area.[9]

Permanent monitoring stations are established under the National Environmental Protection Council (Ambient Air Quality) Measure (National Ambient Air Quality standard), which uses a population-based formula for determining the location of stations. According to the national standard, the EPA is not required to have a permanent monitoring station in the Latrobe Valley.[10] However, due to significant emissions to air from power generating activities, the EPA has placed a permanent monitoring station in the area.[11]

PERMANENT AIR MONITORING STATION AT TRARALGON

The Traralgon monitoring station was established in 1981.[12] It monitors PM_{10}, nitrogen dioxide, ozone, and sulphur dioxide.

The EPA advised the Board that the Traralgon monitoring station was due to be upgraded in February 2014 to also monitor $PM_{2.5}$, but that this was delayed due to the Hazelwood mine fire. The EPA confirmed that this upgrade is now complete.[13]

The Traralgon monitoring station captured data on air quality in the Latrobe Valley throughout the Hazelwood mine fire.

MONITORING CAMPAIGN AT HOURIGAN ROAD, MORWELL (EAST)

For 12 months from 2012–2013, the EPA conducted an air quality monitoring campaign through a monitoring station located in Hourigan Rd in the eastern part of Morwell. This station was established to monitor local air pollution predominately from the local power industry. The results of this monitoring campaign were published on the EPA's website and showed that air quality was at acceptable levels. The monitoring station was decommissioned at the end of the 12 month period, but had not been removed at the time of the Hazelwood mine fire.[14]

The monitoring station was recommissioned on 12 February 2014 by the EPA in response to the Hazelwood mine fire.

EPA AND LATROBE CITY COUNCIL MEETINGS

In 2013, at the invitation of the Latrobe City Council, the EPA and the Council met to discuss air quality monitoring in the Latrobe Valley. Two meetings were held in 2013, one in April and the other in September. These meetings were attended by Mr John Merritt, former Chief Executive Officer of the EPA, along with a number of EPA staff including Dr Paul Torre, Science Officer at the EPA, in his substantive role as Team Principal Expert, Air Quality, and Dieter Meltzer, EPA's Gippsland Regional Manager. A number of councillors from Latrobe City Council attended both meetings.[15]

Latrobe City Council raised a range of environment-related issues with the EPA during these meetings. These included:

- A request by Councillors for a review of the air monitoring stations and air quality in the Latrobe Valley. Councillors felt that permanent monitoring stations in the Latrobe Valley needed to be expanded beyond the permanent station in Traralgon in order to provide adequate and ongoing air quality monitoring in the region due to its unique industry profile. They requested that the EPA make the Hourigan Road monitoring station permanent. The EPA committed to reviewing the number of air quality monitoring stations in the Latrobe Valley.
- A concern that the Latrobe Valley Air Monitoring Network (LVAMN) that was established prior to privatisation of the mines in the area under the State Electricity Commission of Victoria (SECV) was not as well-resourced as it once was.
- EPA communication with the community could be improved regarding air quality data and information, particularly in response to environmental events/emergencies. The Latrobe City Council raised the Morwell River collapse into the Yallourn mine and subsequent water pumping into the Morwell and Latrobe Rivers as examples of too little information being provided by the EPA. The EPA acknowledged that its communication with the community could have been better in these instances.[16]

EPA RESPONSE TO THE HAZELWOOD MINE FIRE

The EPA's primary role in response to the Hazelwood mine fire was to provide expert advice and analysis on the environmental impacts of the fire on Morwell and surrounding areas.[17]

Over the course of the fire, the EPA deployed 136 on-the-ground staff members, with additional support staff working out of its Centre for Environmental Science in Macleod, Victoria.[18]

The scope, scale, resources and duration of EPA activities in its emergency response to the Hazelwood mine fire were significant, and went beyond the EPA's traditional role.[19]

EPA AS A SUPPORT AGENCY IN AN EMERGENCY

As set out in Chapter 2.2 Preparing for fire, Mr Craig Lapsley, Fire Services Commissioner, assumed the role of State Controller prior to and during the Hazelwood mine fire.

On 11 February 2014, the State Control Centre officially requested that the EPA act as a support agency, providing advice to the Fire Services Commissioner, the Chief Health Officer and the State and Regional Control Centres.[20]

The EPA was one of many government agencies that acted as a support agency in response to the Hazelwood mine fire. Along with other agencies, the EPA was involved in the State Emergency Management Team. It was also involved with the Regional Command Centre, which operated out of Traralgon.[21]

EPA INVESTIGATION INTO THE HAZELWOOD MINE FIRE

The EPA Enforcement Review Panel is undertaking an investigation into the Hazelwood mine fire.[22] As this investigation was not complete at the time the Board finalised its report, comment cannot be made on the scope of this investigation.

ENVIRONMENTAL TESTING AND MONITORING DURING THE HAZELWOOD MINE FIRE

COMPREHENSIVE EPA MONITORING AND TESTING

Figure 4.14 shows the locations where EPA monitoring and testing was undertaken during February and March 2014 in response to the Hazelwood mine fire. Figure 4.15 lists the sites by type of monitoring.

Figure 4.14 Location of EPA testing and monitoring[23]

- Air
- Water
- Soil and ash
- Carbon monoxide
- Township

Figure 4.15 EPA testing and monitoring sites, February – March 2014[24]

Site name	Address	Type
Morwell East AMS* (Air Monitoring Station)	70 Hourigan Road, Morwell	Air
Morwell South AMS*	52 Hazelwood Road, Morwell	Air
Churchill	Federation University, Churchill	Air
Kernot Hall	80 Princes Drive, Morwell	Air
Traralgon AMS*	130 Kaye Street, Traralgon	Air
St Luke's Uniting Church	281 Princes Drive, Morwell	Air
Moe	46–48 Albert Street, Moe	Air
Kindergarten	14 Maryvale Crescent, Morwell	Air
Morwell Bowling Club	52 Hazelwood Road, Morwell	CO
The Morwell Club	136 Helen Street, Morwell	CO
Morwell Centenary Rose Garden	Maryvale Crescent, Morwell	CO
Sacred Heart Primary School	Cnr Elgin and Wilson Streets, Morwell	CO

Site name	Address	Type
Commercial Road	250 Commercial Road, Morwell	CO
Woolum Bellum Koorie P–12 School	Cnr Hoyle Avenue and Harold Street, Morwell	CO
Morwell Park Primary School	Cnr Vary and Bolger Streets, Morwell	CO
Latrobe Regional Hospital	Princes Freeway, Traralgon West	CO
Morwell Police Station	14 Hazelwood Road, Morwell	CO
Farnham Court Motel	Monash Way/Princes Drive, Morwell	CO
Brickworks	Briquette Factory, Ridge Road, Morwell	CO
Churchill Police Station	6 Switchback Road, Churchill	CO
Morwell Fire Station	Cnr Spry Street and McDonald Road, Morwell	CO
Morwell Hotel	Cnr Vincent and Princes Streets, Morwell	CO
Latrobe Street	Cnr Latrobe/Wagner Streets, Morwell	CO
12 Wallace Street, Morwell	12 Wallace Street, Morwell	CO
59 Hazelwood Road, Morwell	59 Hazelwood Road, Morwell	CO
Morwell East AMS	70 Hourigan Road, Morwell	Soil & Ash
11 Willis Crescent, Morwell	11 Willis Crescent, Morwell	Soil & Ash
Traralgon Golf Course	Princes Freeway, Traralgon	Soil & Ash
Lake Narracan South Boat Ramp	Sullivan's Road, Yallourn	Soil & Ash
Latrobe River at Thoms Bridge	Tanjil East Road, Maryvale	Soil & Ash
Club Astoria (German Club)	Cnr Elgin Street and Maryvale Crescent, Morwell	Soil & Ash
Morwell Football Club	11 Aherin Street, Morwell	Soil & Ash
34 Wallace Street	34 Wallace Street, Morwell	Soil & Ash
Morwell Bowling Club	52 Hazelwood Road, Morwell	Soil & Ash
7 Davey Street, Morwell	7 Davey Street, Morwell	Soil & Ash
CFA car park	26 MacDonald Street, Morwell	Soil & Ash
Keegan Street Reserve, Morwell	Keegan Street Reserve, Morwell	Soil & Ash
Morwell East AMS	70 Hourigan Road, Morwell	Water
Dirty Dam	Hazelwood Mine, Morwell	Water
Hazelwood pondage (Eel Hole Creek)	Princes Freeway, Traralgon	Water
HARA Dam	Hazelwood Mine, Morwell	Water
Hazelwood pondage	Hazelwood Mine, Morwell	Water
Morwell river u/s Eel Hole Creek	Princes Freeway, Traralgon	Water
Morwell main drain u/s of wetlands	Princes Freeway, Traralgon	Water
Hazelwood pondage pump house 50	Hazelwood Mine, Morwell	Water
Morwell River d/s Eel Hole Creek	Princes Freeway, Traralgon	Water
11 Willis Crescent, Morwell	11 Willis Crescent, Morwell	Water
Traralgon Golf Course	Princes Freeway, Traralgon	Water
Lake Narracan South Boat Ramp	Sullivan's Road, Yallourn	Water
Latrobe River at Thoms Bridge	Tanjil East Road, Maryvale	Water

*Represents permanent / fixed monitoring station
CO = Carbon monoxide
u/s = upstream
d/s = downstream

AIR MONITORING DURING THE HAZELWOOD MINE FIRE

AIR MONITORING LOCATIONS

Figure 4.16 demonstrates the location of air monitoring sites during the Hazelwood mine fire.

Figure 4.16 Latrobe Valley monitoring sites – air[25]

Air

5 sites continuing for 2014–2015

Township

Figure 4.17 demonstrates the location of carbon monoxide monitoring sites during the Hazelwood mine fire.

Figure 4.17 Latrobe Valley monitoring sites – carbon monoxide[26]

Carbon monoxide

Township

AIR MONITORING EQUIPMENT

Air quality monitoring equipment varies from continuous monitors installed in air-conditioned buildings, to mobile vehicles, right through to hand-held monitors. The equipment varies according to the pollutant measured, the method of monitoring and the timing and accuracy of the measurement. Monitoring equipment also varies in how complex it is as a piece of technology. Some monitoring equipment can be used instantaneously, such as pre-calibrated hand-held monitors, whereas other equipment can take anywhere from a day to a number of weeks to set up and calibrate in order to capture data accurately.

The EPA used a suite of air monitoring equipment to test air quality during the Hazelwood mine fire. Equipment included three full reference/fixed monitoring stations at Traralgon, Hourigan Road, Morwell (East) (see Figure 4.18), and the Morwell Bowling Club (South) (see Figure 4.19).

Figure 4.18 Fixed Air Monitoring Station – Hourigan Road, Morwell (East)[27]

Figure 4.19 MoLab – Morwell Bowling Club (South)[28]

In addition to the three fixed monitoring stations, a range of mobile air monitoring equipment was deployed in Morwell (and surrounding areas) that produced indicative data. This included the DustTrak that was placed at the Morwell Bowling Club (South) to measure $PM_{2.5}$ (pending the arrival of the MoLab), canisters to measure volatile organic compounds, air visibility monitors to measure concentrations of particles, Area RAE monitors to measure carbon monoxide, and a TravelBLANkET from Environment Tasmania to measure $PM_{2.5}$ (see Figures 4.20–4.24).[29]

This is not an exhaustive list of the air monitoring devices used, but gives the reader some indication of the diversity and in some cases, complexity of these pieces of scientific equipment.

Figure 4.20 DustTrak – Morwell Bowling Club (South)[30]

Figure 4.21 VOC Canister – Maryvale Crescent, Morwell[31]

Figure 4.22 ADR 1500 – Air Visibility Monitor[32]

Figure 4.23 Area RAE (carbon monoxide) at Morwell Bowling Club (South)[33]

From 20 February 2014, the TravelBLANkET was used to log data. Dr Torre told the Board that BLANkET stands for 'Baseline Air Network of EPA Tasmania.'[34]

Figure 4.24 TravelBLANkET[35]

AIR MONITORING RESULTS

VISIBILITY

Figure 4.25 Validated and indicative visibility reduction levels for the Latrobe Valley from 9 February 2014 – 31 March 2014 (one hour average)[36]

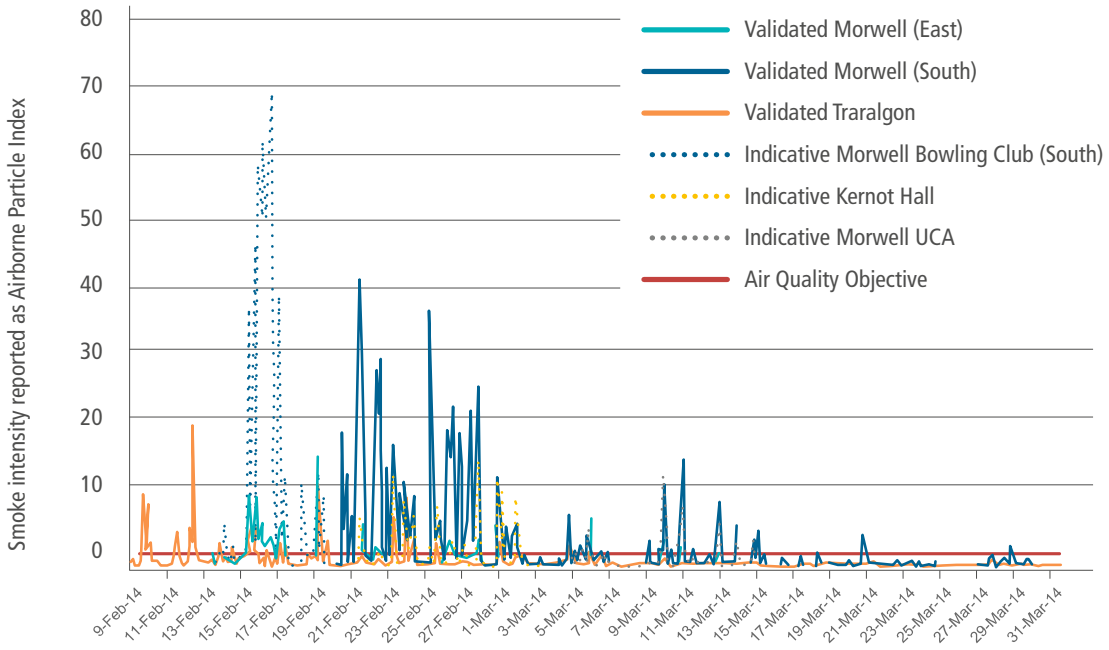


Figure 4.25 adapted from an EPA graph shows validated data (solid line), and indicative data plotted retrospectively (dotted line) for one hour averages for visibility reduction in the Latrobe Valley from 9 February 2014 to 31 March 2014.

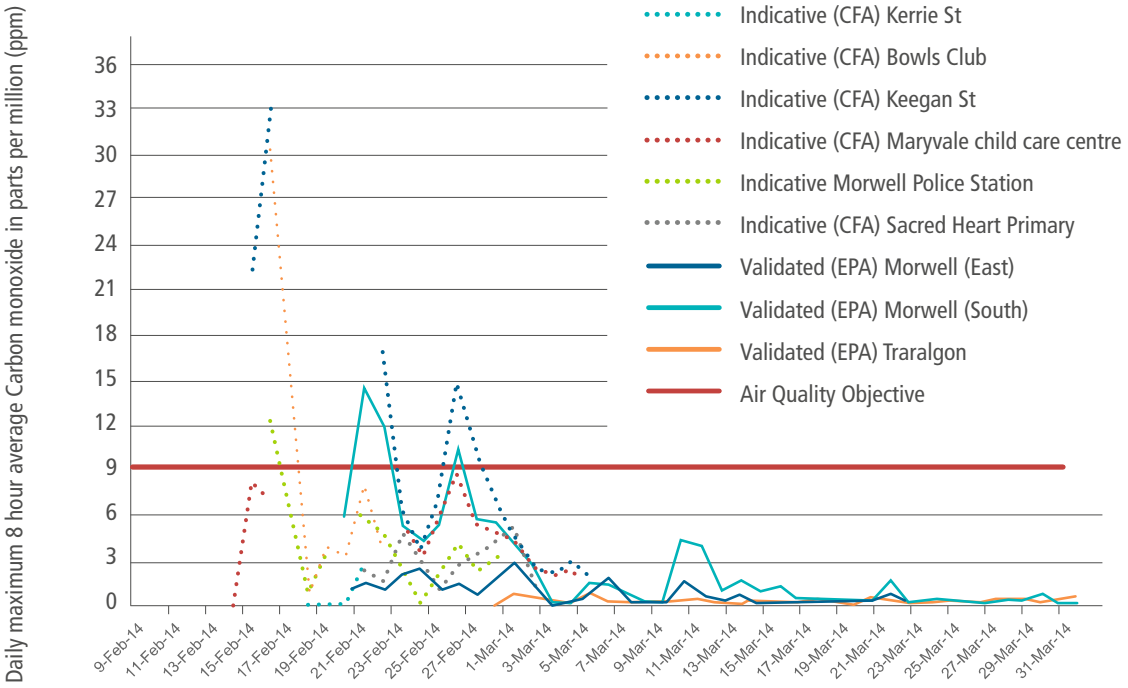
The State Environment Protection Policy (Ambient Air Quality) (State Ambient Air Quality standard) for visibility reduction, measured as the minimal visibility distance, is 20 kilometres for one hour.[37] This standard is indicated in Figure 4.25 by the red line. It is not clear from the EPA graph how the standard of 20 kilometres for one hour relates to the red line. It is clear that the one hour averages of both validated and indicative data are above the standard on a number of occasions. However in his evidence to the Board, Dr Torre stated (in relation to 16 February 2014):

> On that Sunday when I did come down, it was around about 5 o'clock, the visibility was down to, oh, less than a kilometre. We've got a table that sort of guides people in terms of trying to understand those levels, and it was at levels where, if you look at the categories, it's called 'hazardous' – that's very high levels.[38]

The Board is not in possession of the table Dr Torre refers to. However, according to the Californian Wildfire Smoke Protocol that was discussed during the hearings, the table used for estimating visibility reduction states that visibility less than one mile (approximately 1.6 kilometres) is classified as 'hazardous'.[39]

CARBON MONOXIDE

Figure 4.26 Validated and indicative carbon monoxide levels for Morwell and Traralgon from 9 February 2014 – 31 March 2014 (8 hour average)[40]



The above Figure adapted from an EPA graph shows validated data (solid line) and indicative data plotted retrospectively (dotted line). The State Ambient Air Quality standard for carbon monoxide is 9 ppm averaged over eight hours. This standard is indicated in Figure 4.26 by the red line.

Both Dr Torre and independent expert Ms Claire Richardson, Managing Director and Principal Consultant, Air Noise Environment Pty Ltd, advised the Board that the levels of carbon monoxide recorded in Morwell on 21 February 2014, 22 February 2014 and 26 February 2014, exceeded the State Ambient Air Quality standard. They also advised that carbon monoxide levels were likely to have been exceeded on 15 February 2014 and 16 February 2014 (when only indicative data was available).[41]

The maximum value of carbon monoxide recorded (eight hour rolling average) in Morwell during the mine fire was 14 ppm. However, there are estimated readings of up to 34 ppm (eight hour rolling average) on the evening of 15 February 2014.[42] There is no data on carbon monoxide levels available from 9 February to 11 February 2014.[43]

PARTICULATE MATTER ($PM_{2.5}$)

Figure 4.27 Validated and indicative $PM_{2.5}$ levels for Morwell and Traralgon from 9 February 2014 – 31 March 2014 (daily averages)[44]

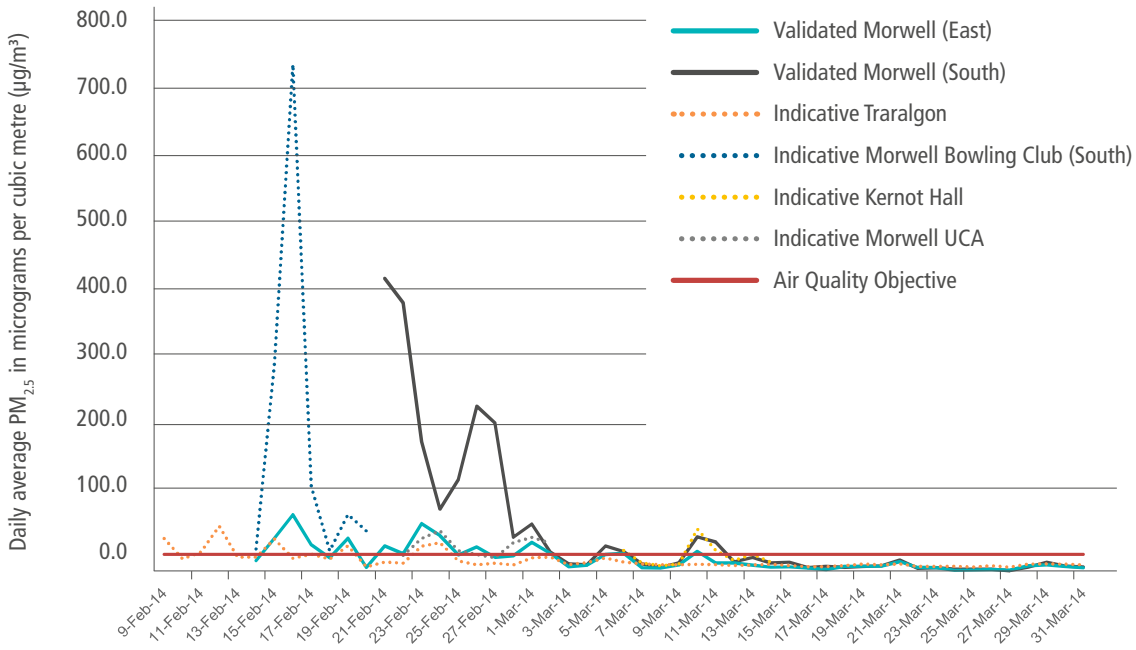


Figure 4.27 adapted from an EPA graph shows validated data (solid line) and indicative data plotted retrospectively (dotted line) for daily averages of $PM_{2.5}$ in Morwell from 9 February to 31 March 2014. The Victorian standard (advisory) for $PM_{2.5}$ is 25 µg/m³ measured over one day. This standard is indicated in Figure 4.27 by the red line.

The graph shows that there were three peaks (above the red line) of increased levels of $PM_{2.5}$ between 15 February 2014 and 16 February 2014, and around 21 February 2014 and 26 February 2014.

In their joint expert report to the Board, Dr Torre and Ms Richardson advised that from 14 February 2014 until 31 March 2014, in the area south of Commercial Road, Morwell, there were:

- 21 days where the levels of $PM_{2.5}$ exceeded the advisory reporting standard (greater than 25 µg/m³)
- seven days that would be classified as hazardous in the $PM_{2.5}$ Health Protection Protocol (equal or greater than 157 µg/m³)
- four days where the levels (indicative and validated) were in the extreme category in the $PM_{2.5}$ Health Protection Protocol (greater than 250 µg/m³).[45]

Due to the need for scientific calibration of data, indicative data was not available to the EPA and the Department of Health until after the fire was controlled (which was on 10 March 2014).[46]

The highest validated recording of $PM_{2.5}$, as shown in Figure 4.27 was over 400 µg/m³ (on about 21 February 2014). This is approximately 16 times the daily National Ambient Air Quality standard of 25 µg/m³.

The highest indicative recording of $PM_{2.5}$, as shown in Figure 4.27, was over 700 µg/m³ between 15 and 16 February 2014. This is approximately 28 times the daily National Ambient Air Quality standard of 25 µg/m³.

Figure 4.28 Indicative $PM_{2.5}$ levels from the DustTrak at the Morwell Bowling Club (South) from 13 February 2014 – 20 February 2014 (hourly averages)[47]

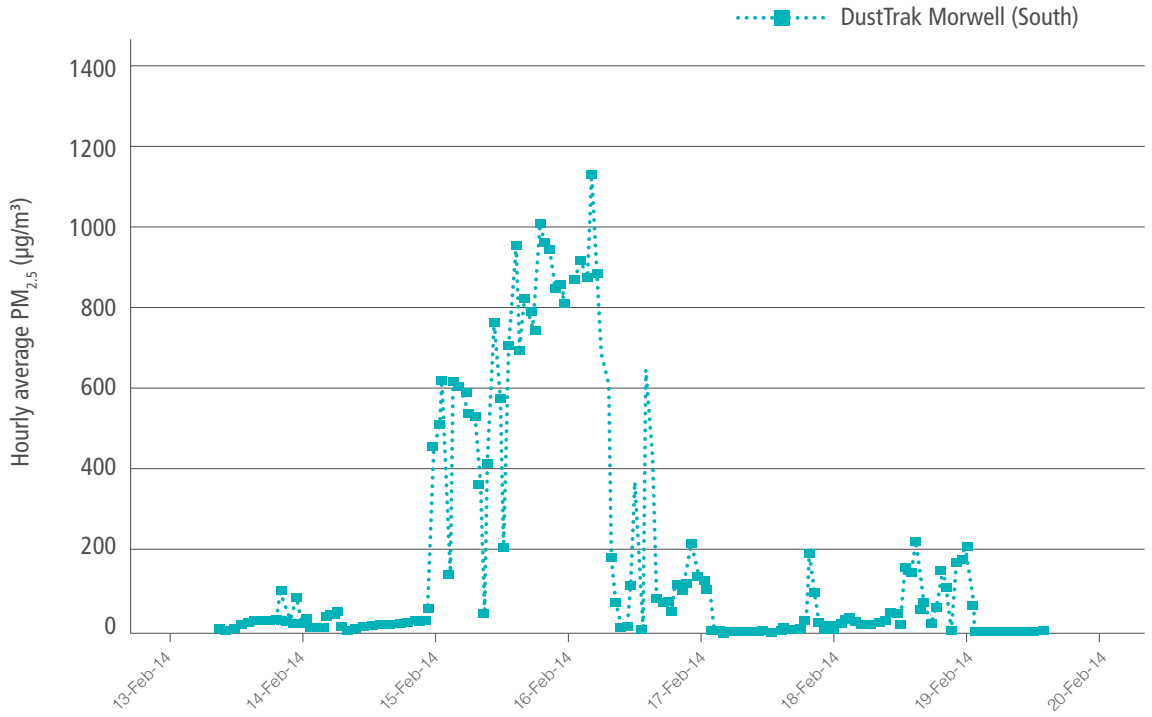


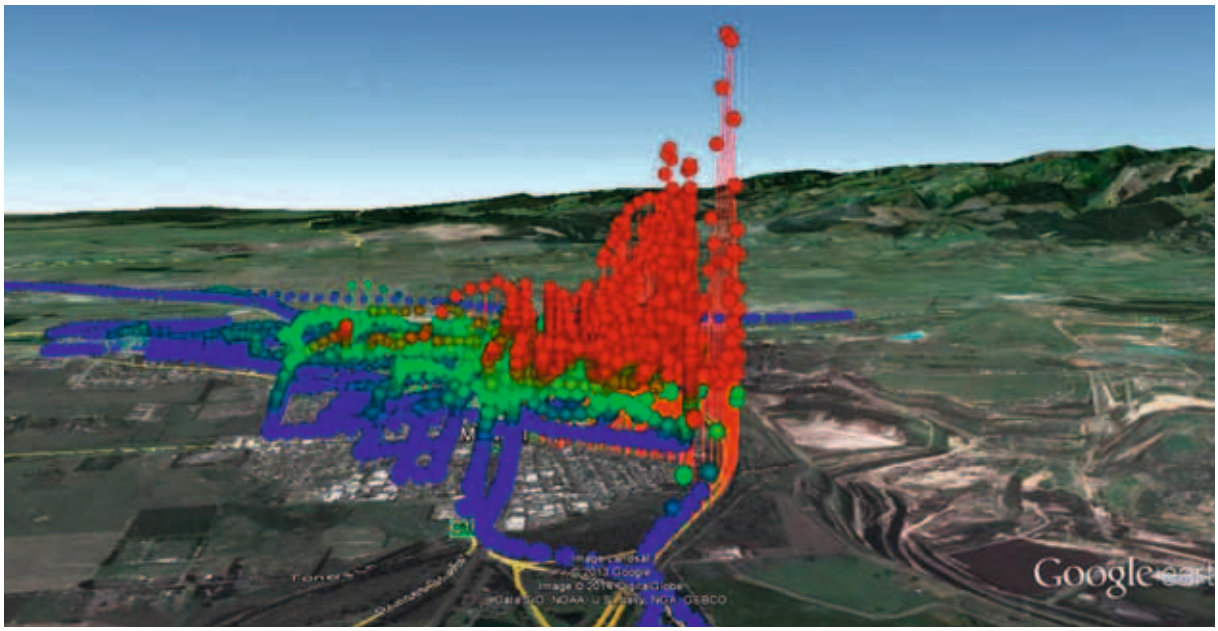
Figure 4.28 adapted from an EPA graph shows indicative data for hourly averages of $PM_{2.5}$ from the DustTrak monitor that was located at the Morwell Bowling Club (South) from 13 February 2014, until the MoLab was made ready and transported there as a fixed monitoring station. The maximum recorded $PM_{2.5}$ level was just below 1,200 µg/m³ on 17 February 2014. There is no hourly standard for $PM_{2.5}$.

Figures 4.29 and 4.30 below show the instantaneous $PM_{2.5}$ levels measured by the TravelBLANkET while driving around Morwell on 22 February 2014. Height and colour represent concentrations of $PM_{2.5}$ measured by the TravelBLANkET. Red markers indicate higher concentrations and blue markers indicate lower concentration levels. These images clearly show a greater level and distribution of fine particles closest to the mine site, in the southern part of Morwell. These images were not made publicly available by the EPA during the course of the mine fire.

Figure 4.29 Instantaneous $PM_{2.5}$ levels measured by the TravelBLANkET on 22 February 2014 (aerial view)[48]

- Greater than 250 µg/m³
- Between 100 – 250 µg/m³
- Between 0 – 100 µg/m³

Figure 4.30 Instantaneous $PM_{2.5}$ levels measured by the TravelBLANkET on 22 February 2014 (looking east)[49]



- Greater than 250 µg/m³
- Between 100 – 250 µg/m³
- Between 0 – 100 µg/m³ [50]

PARTICULATE MATTER (PM_{10})

Figure 4.31 Validated and indicative results for PM_{10} levels in Morwell and Traralgon from 9 February 2014 – 31 March 2014 (daily averages)[51]

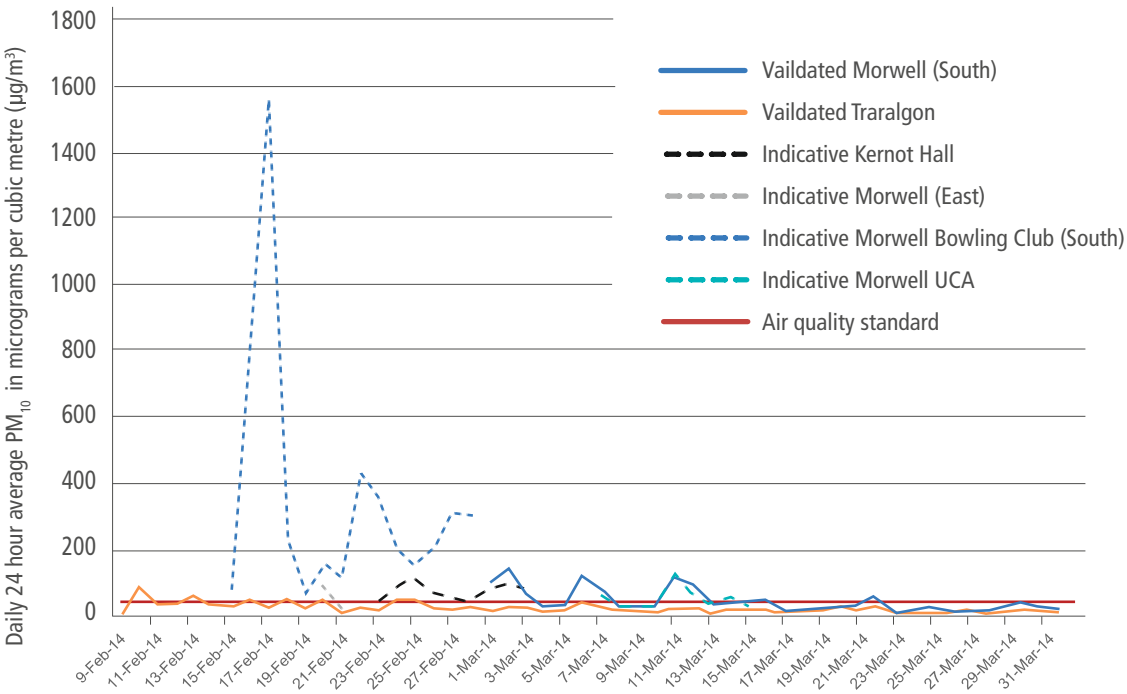


Figure 4.31 adapted from an EPA graph shows validated data (solid line) and indicative data plotted retrospectively (dotted line) for daily averages of PM_{10} in Morwell and Traralgon from 9 February 2014 to 31 March 2014. The Victorian standard for PM_{10} is 50 µg/m^3 averaged over one day. This standard is indicated on Figure 4.31 by the red line.

The EPA prioritised monitoring carbon monoxide and $PM_{2.5}$ during the mine fire, as these are of most concern to human health.[52] This explains why validated data for PM_{10} was not monitored at the Morwell Bowling Club (South) until around 27 February 2014.

The highest indicative recording of PM_{10} in Figure 4.31 is just below 1,600 µg/m^3 (on around 15–16 February 2014). This is approximately 30 times the National Ambient Air Quality standard.

SULPHUR DIOXIDE

Figure 4.32 Validated sulphur dioxide levels for Morwell and Traralgon from 9 February 2014 – 31 March 2014 (1 hour average)[53]

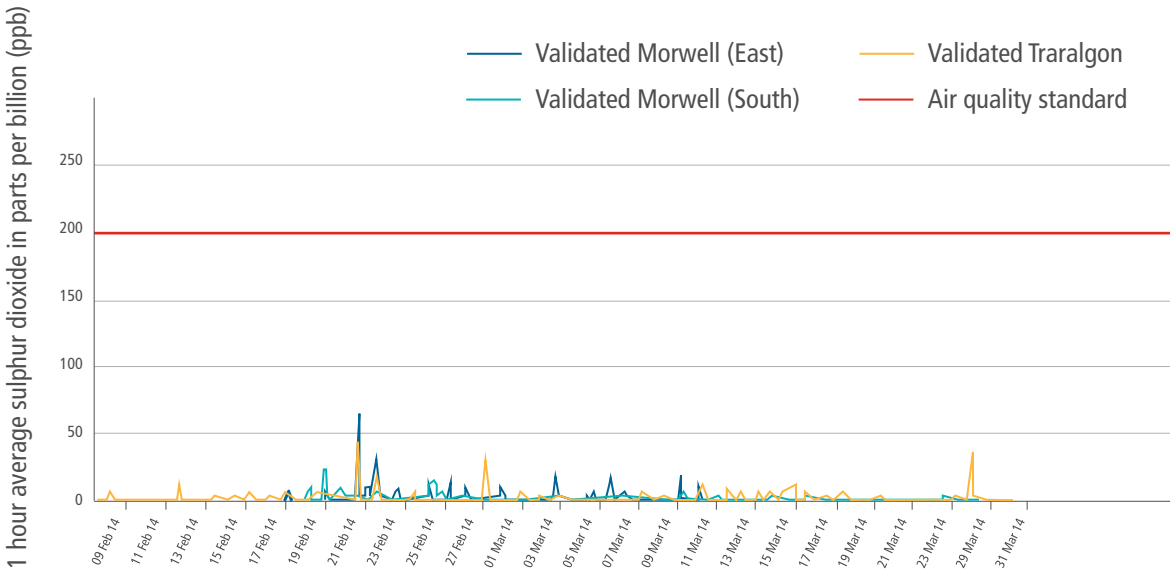


Figure 4.32 adapted from an EPA graph shows that sulphur dioxide levels in Morwell and Traralgon did not exceed the State Ambient Air Quality standard over the course of the Hazelwood mine fire.[54]

NITROGEN DIOXIDE

Figure 4.33 Validated nitrogen dioxide levels for Morwell and Traralgon from 9 February 2014 – 31 March 2014 (1 hour average)[55]

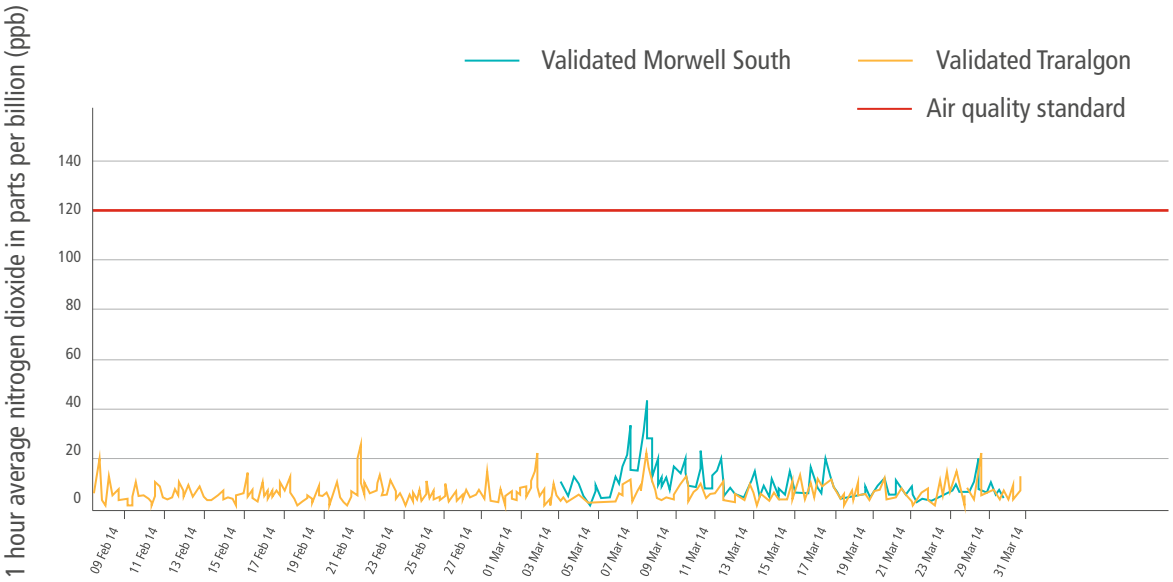


Figure 4.33 adapted from an EPA graph shows that nitrogen dioxide levels in Morwell and Traralgon did not exceed the State Ambient Air Quality standard over the course of the Hazelwood mine fire.[56]

VOLATILE ORGANIC COMPOUNDS

In his statement to the Board, Mr Merritt noted that all but one of 14 of the volatile organic compounds measured were many times lower than the State Ambient Air Quality standard. Only benzene exceeded the assessment criterion of nine parts per billion, at the following locations:

- Maryvale Crescent Preschool – 9.2 parts per billion on one occasion (date not specified). There were no children at the Preschool during the Hazelwood mine fire.
- Morwell Bowling Club (South) – 14 parts per billion on 26 February 2014 and 9.7 parts per billion on 27 February 2014.

The EPA informed the Department of Health and the Chief Health Officer of these results by email. Monitoring of benzene is included as part of the EPA's monitoring in Morwell. This monitoring will continue for at least 12 months to March 2015.[57]

OZONE

Figure 4.34 Validated ozone levels for Morwell and Traralgon from 9 February 2014 – 31 March 2014 (1 hour average) [58]

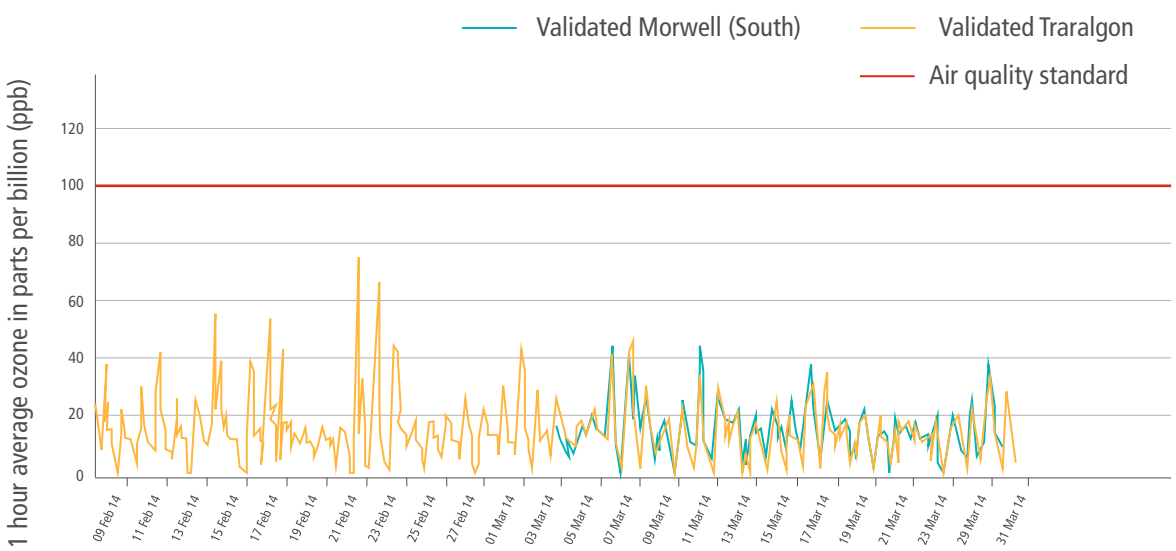


Figure 4.34 adapted from an EPA graph shows that ozone levels in Morwell and Traralgon did not exceed the State Ambient Air Quality standard over the course of the Hazelwood mine fire.[59]

AIR QUALITY MONITORING IN AN EMERGENCY

Ms Richardson set out the three stages of an effective monitoring response in an emergency:

Stage 1: initial emergency response: subjective response and monitoring using hand-held emergency type instrumentation intended to screen for extremes in pollution exposure.

Stage 2: rapid deployment of relatively low cost portable monitors that offer a known degree of accuracy, are able to be installed quickly and easily, and can be installed at a number of locations to provide reasonable spatial coverage.

Stage 3: implementation of a high quality monitoring station to provide accurate data that is compliant with the relevant national standards.[60]

Ms Richardson advised the Board that this general approach was followed during the Hazelwood mine fire.[61] However, she noted that where an incident is expected to cause significant air emissions that extend for longer than a day, additional monitors should be considered and the initial response should involve installation of temporary portable monitoring stations as soon as possible. Importantly, although these monitors would not be full 'reference' monitors that comply with the National Ambient Air Quality standard, the instruments would be expected to provide greater certainty in terms of data accuracy than the initial emergency response monitoring that occurred in this instance.[62]

CHALLENGES WITH AIR QUALITY MONITORING DURING THE HAZELWOOD MINE FIRE

MONITORING STATIONS

In their joint report, Ms Richardson and Dr Torre told the Board that:

> The Morwell South [monitoring] station was [in] the optimum position and allowed determination of the worst case community exposure. In an ideal world, the station would have been operational earlier in the incident.[63]

The monitoring conducted by the EPA from 13 February 2014 onwards at Hourigan Road, Morwell (East) also provided valuable data.

However, in her joint report with Dr Torre, Ms Richardson made the following statement:

> Installation of a 'reference' monitoring station of the quality installed at Morwell East was not necessary to inform the emergency response. However, it was fortunate that the station could be re-commissioned quickly, and the monitoring provided useful additional measurements to assist with the overall community monitoring. I would be concerned if the re-commissioning of Morwell East took precedence over implementing the monitoring station at Morwell South and the broader monitoring using hand held instruments. I understand from discussions with Dr Torre that this is not the case. Dr Torre has explained that the implementation of Morwell South and the portable monitoring efforts were completed in parallel with the re-commissioning of Morwell East.[64]

READINESS OF AIR MONITORING RESPONSE

Currently, the EPA lacks a comprehensive emergency response capability. As Dr Torre has noted:

> It would be very rare for me, or other EPA Science Officers or Laboratory Emergency Response Officers to attend an emergency event, with air monitoring equipment. EPA has very limited air monitoring equipment for measuring air emissions from emergency incidents.[65]

Dr Torre also told the Board that when called out to an emergency event such as an oil spill, the EPA relies on the hand-held monitoring equipment it knows emergency service personnel carry on them as part of their occupational health and safety practices, to help with an initial assessment of the situation.[66] In his evidence to the Board, Dr Torre explained that when he was first called to the Hazelwood mine fire he utilised the Country Fire Authority's (CFA) equipment to measure the carbon monoxide levels around the perimeter of the mine.[67] That is, the EPA used the CFA's carbon monoxide detection equipment to measure levels in the community. Dr Torre stated that 'it is not uncommon to work with the Fire Brigade to try and understand impact assessment'.[68]

In his statement to the Board, Mr Merritt commented that the EPA may need to consider updating its mobile monitoring and modelling equipment based on a history of previous incidents and predictions of future fire events.[69]

As Ms Richardson noted:

> In this situation there needs to be an [sic] whole of government rapid response approach allow [sic] air quality to be monitored in a short period of time. This needs to include maintaining appropriate instrumentation resources that are suitable for rapid deployment, and trained personnel to operate the instrumentation during emergency events.[70]

TECHNICAL DIFFICULTIES

There were some delays in establishing and maintaining monitoring at various locations in Morwell and surrounding areas due to the availability and serviceability of monitoring equipment. The EPA also encountered a number of technical challenges in relation to air monitoring. This is not unusual in itself as the equipment used is highly sensitive. However there was both an urgency and high degree of pressure involved in fixing issues as they arose, due to the nature of the event.

The first set of technical challenges occurred with the decision in the first week to set up a reference monitoring station close to the fire in the southern part of Morwell. Individual testing equipment had to be sourced from within the current network, and then checked, calibrated and brought up to standard in tight timeframes. The MoLab needed mechanical work. The MoLab site needed power and data communications needed configuring. None of these components presented a difficulty individually, but difficulty was experienced in trying to perform all of these functions very quickly. A process that might normally take four weeks was completed in four days.[71]

The MoLab that had become the fixed monitoring site at Morwell Bowling Club (South) developed a leak in the roof on two occasions. This was attended to in the first instance with tape, and in the second with a tarpaulin. There was no loss of data.[72]

There were early difficulties with the transfer of carbon monoxide data from the CFA to the EPA. Technologies at the two organisations were incompatible–such a transfer had never been attempted previously. The issue was addressed through a labour-intensive manual transfer, until an automated process could be finalised. By the second week of the response, an EPA officer was specifically tasked with doing this transfer each day. The process was streamlined by the second week of March 2014. Mr Merritt told the Board that in the future appropriate arrangements will be made with the CFA.[73]

In addition:

- On 14 February 2014, the newly installed modem at Hourigan Road, Morwell (East) failed. This did not result in any loss of data (it was still being recorded inside the station), but it did result in a delay of 32 hours in getting the data streaming directly onto the EPA website.[74]
- On 16 February 2014, there was a software problem on the main data collection system that required a system restart. Again there was no loss of data, but the issue caused a 10 hour gap in the website display.[75]
- On 19 February 2014, the wind direction sensor at the Morwell Bowling Club (South) was twisted by strong winds and there was a loss of local wind direction data for 42 hours until it could be replaced.[76]
- On 22 March 2014, the modem in the particle monitor at Moe failed, and this took 60 hours to replace due to its specialised nature. Again data was not lost, however this data set was not available for the website.[77]
- On 27 March 2014, the air monitoring equipment at Morwell Bowling Club (South) had to be cleaned (due to the heavy smoke impacts since deployment). This resulted in a data loss of five hours.[78]

ACCESS TO LABORATORIES TO ANALYSE DATA

The EPA has one contract with one National Association of Testing Authorities (NATA) accredited laboratory and a backlog was created with the number of samples the EPA was sending for analysis.[79] Dr Torre told the Board that there was an issue with sufficient access to laboratories during the mine fire and that he considered that more laboratories were required.[80]

DATA ACCURACY AND ANALYSIS

During the mine fire, the EPA requested both interim and final results from its laboratories. 'Interim' and 'final' results refer to the life cycle of a data set that is produced from a fixed or permanent monitoring station.

Interim results were requested as soon as they were available so that the EPA had as much information as possible as soon as possible. It is the experience of the EPA that it is very rare that final results differ from the interim results.[81]

Interim results are not to be confused with indicative results. Indicative data is data taken from hand-held or portable air quality monitoring equipment, rather than data logged from a permanent monitoring station that automatically streams data back to the EPA. Indicative data may not be 100 per cent accurate, but it provides the best estimate of air quality in the absence of data validated through the EPA's processes.

There is merit in using indicative data in emergency response situations as it can be accessed promptly to help decision makers.

As Mr Merritt told the Board:

> In circumstances where there is a lack of available data, the expectations and needs for accuracy are appropriately limited. During the early stages of the Hazelwood Mine Fire when air quality readings exceeded limits in the measurement standards, absolute accuracy of the readings was not the highest priority. Indicative data was sufficient.[82]

PM_{10} data collected from the permanent monitoring station in Traralgon during the mine fire was able to indicate what the air quality was like in Morwell. This is because Traralgon is east from Morwell (and the mine fire) and PM_{10} data readings correlate with $PM_{2.5}$. In other words, if PM_{10} levels are raised in Traralgon, $PM_{2.5}$ levels will be raised in Morwell. The PM_{10} data from the permanent monitoring station in Traralgon indicated that the peak air quality impacts were likely to have hit Morwell just after midday on 9 February 2014, with a slightly higher peak occurring around midday on 10 February 2014.[83]

Ms Richardson told the Board that a key feature of effective air quality monitoring is immediate access to monitoring data to inform the emergency response.[84]

In their joint report, Ms Richardson and Dr Torre also noted that having the capability to download carbon monoxide data remotely via a modem would allow for rapid access to that data.[85]

ONGOING AIR QUALITY MONITORING

The EPA is continuing to conduct air quality monitoring in Morwell and surrounding areas in addition to the permanent monitoring station in Traralgon (which now also captures $PM_{2.5}$) and will do so for at least the 12 months following the Hazelwood mine fire. This monitoring will include:

- collecting data for $PM_{2.5}$ and visibility as well as gaseous particles (sulphur dioxide, carbon monoxide, nitrogen oxides and ozone) at the Morwell Bowling Club (South)
- a subset of the above compounds will also be collected at Hourigan Road, Morwell (East)
- collecting data and interpreting results for both respirable silica and polycyclic aromatic hydrocarbons at Morwell (South)
- particlulate matter sampling at Moe and Churchill
- passive samplers at three locations across Morwell to collect data about volatile organic compounds.[86]

SMOKE BEHAVIOUR

The reach and extent of smoke over an area is influenced by a number of factors, including the success of fire suppression, wind direction and speed, and temperature.

The amount of smoke emitted into the atmosphere and the impact of this smoke on Morwell and the Latrobe Valley varied over the 45 days that the Hazelwood mine fire burned. At its worst, visibility was less than one kilometre and a blanket of acrid choking smog infiltrated people's homes, businesses and public buildings.[87] On other days the air quality was considered good or fair, and visibility was reasonable.

Ms Brooke Burke, Morwell Business Owner, told the Board that 'each day [of the mine fire] was very different, so some days it was clear at the studio, some days it was very bad at home. Some days at home it was clear and some days it wasn't as good at the studio.'[88]

Dr Torre explained to the Board that during the mine fire south-westerly winds had the greatest impact on the distribution of smoke in Morwell.[89]

Figure 4.35 Validated $PM_{2.5}$ levels and corresponding wind direction for Morwell from 21 February 2014 – 15 March 2014 (24 hour average)[90]

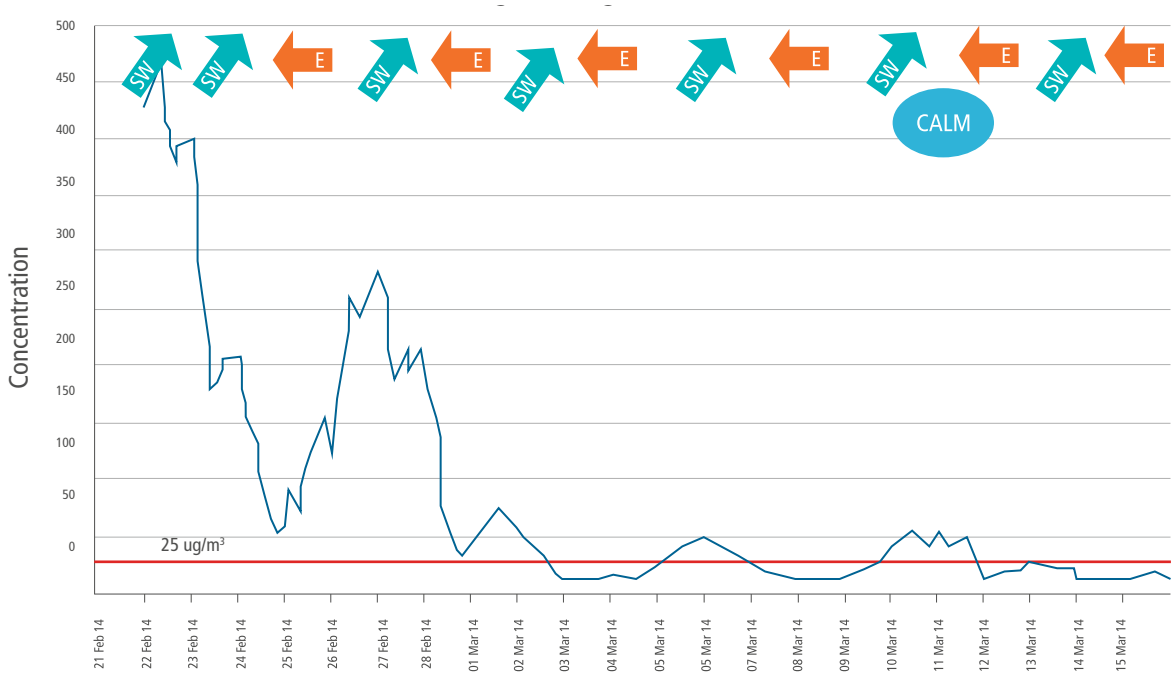


Figure 4.35 demonstrates the levels of $PM_{2.5}$ recorded at the Morwell Bowling Club (South) air monitoring station between 22 February 2014 and 15 March 2014. The red line indicates the State Advisory standard for $PM_{2.5}$.

The Figure shows that when the wind blew in a south-westerly direction the recorded levels of $PM_{2.5}$ increased. This is particularly evident on 21–23 February 2014 and 26–28 February 2014 when the levels of $PM_{2.5}$ were significantly higher than on other days.

INDOOR AIR QUALITY

Most of the EPA's focus during the Hazelwood mine fire was on ambient (outdoor) air quality monitoring and testing.[91] Due to the duration of the fire, many people in the community expressed their concern about the quality of air and presence of ash inside their homes, schools, businesses and workplaces.

Despite the best efforts of the community to act on the advice given to them by the EPA to limit exposure to the air outside (by staying indoors and closing windows and vents), the community's experience was that this did not stop smoke and ash from getting inside. This was particularly the case for residents who have older style houses with gaps in floorboards, windows or door frames.

Ms Burke was 34 weeks pregnant, and had a two year old son at the time of the mine fire. She runs a dance school with her business partner in Driffield Road and lives in Tarwin Street, both of which are located approximately 1.5 kilometres from the mine site. Ms Burke described to the Board what it was like returning to her home at approximately 9 pm on the evening of 10 February 2014, having spent the previous night at her parents' house (located in a part of Morwell furthest from the mine):

> I couldn't stay there, it was definitely too smoky and, yes, you could see the haze through the house probably to waist height… We live in an older style house, so obviously there's not as much ventilation as there would be in a new home, so we found that the smoke really was quite well contained in our home. Outside it was very dark and hazy, even driving down from my mum and dad's house on the other side of Morwell to our place you couldn't really see that far in front of you. You could see maybe 15 metres in front of you and then from there it was quite hazy and very dark… I went home a few days, probably 45 minutes, that was long enough to be there, it was quite bad in our house and the smell and the smoke, you could just feel it straight away when you went into there that it was definitely more challenging to breath[e], and I wasn't going to bring my 2-year-old home to that.[92]

As indoor air quality is strongly influenced by the outdoor environment, the concentration of air pollutants indoors can be comparable to concentrations in the ambient air environment (Ohura, 2010, p. 414). The longer the mine fire burned, the more smoke and ash were emitted into the atmosphere, which made it increasingly difficult for people to keep the air inside their homes and businesses separate from the air outside. The amount of smoke and ash inside was dependent on the proximity of people's homes and businesses to the mine site and the style and age of buildings (see Figure 4.36).

Figure 4.36 Smoke engulfs the streets and residential properties of the Morwell community

Image source: *Newspix / News Ltd*

MONITORING OF SOIL, ASH AND WATER

In addition to air quality monitoring and testing, the EPA established a comprehensive program to test soil, ash and water for contaminants produced by the Hazelwood mine fire.

SOIL AND ASH

Surface and subsurface soil from within the immediate and surrounding areas of the mine fire were sampled and analysed from 24 February 2014 (see Figure 4.37).[93] Mr Merritt notes that these samples were consistent and within the normal variation that would be expected for soil.[94]

The EPA reported that appropriate testing of surface and subsurface soil samples to distinguish between the natural versus the impacted environment was difficult. The amount of ash deposited on soil was also limited, which made it difficult to test.[95]

Ash samples were collected from 24 February 2014.[96] The EPA reported that ash deposits were not significant enough in many places to conduct sufficient testing. Ash was only found in protected areas where it had been blown and accumulated. This made it challenging for the EPA to distinguish mine fire ash from bushfire ash, which was also present in the area. Some samples were collected from the garages and sheds of Latrobe Valley residents, where ash had been protected from rain and wind.[97] Once results were received, it was evident to the EPA that the ash from the mine fire was different.[98]

Mr Merritt told the Board that ash samples will be further analysed by the EPA to determine whether the ash contains contaminants that could end up in waterways and soil.[99] The results of that analysis will inform the long-term health study announced by the Department of Health.[100]

Figure 4.37 Latrobe Valley monitoring sites – soil[101]

Soil and ash

Four sites continuing for 2014 – 2015

Township

WATER

The EPA collected water samples from waterways (wetlands, streams, rivers and drains) near Morwell (see Figure 4.38) and tested for toxic elements that may have come from the smoke and ash emitted by the Hazelwood mine fire. Toxic elements impacting on water can include heavy metals like zinc and mercury, complex organic compounds such as benzene, surfactants (found in firefighting products), and various other compounds.[102]

The EPA conducted testing before and after rain to capture any contaminants that may have been washed from land into water.[103] Water testing in residential areas in Morwell and surrounding areas was conducted weekly from 18 February 2014.[104]

The EPA reported that appropriate testing of 'background sites' was initially difficult. Finding background sites allows for a comparison of the natural versus impacted environment. Such sites needed to be close by, but not directly impacted by the fire.[105]

Water was sampled and tested in one water tank located in Willis Crescent, Morwell on four occasions from 23 February – 17 March 2014. The results were compared to standards for drinking water, although the EPA had no evidence this tank was used for drinking water.[106] The EPA stopped this particular water sampling after receiving advice from the Department of Health that it was not necessary.[107] The water results provided to the Board showed a small percentage of exceedences compared to relevant standards.[108]

The EPA also sampled and tested water in three dams that supplied water for firefighting. These dams were sampled from 15 February 2014 and the data provided to the CFA.[109]

Water and carbon monoxide monitoring for workplace air and water quality standards, as they apply to firefighters, is dealt with in Chapter 4.4 Firefighter health.

Figure 4.38 Latrobe Valley monitoring sites – water[110]

Water

Eight sites continuing for 2014 – 2015

Township

EPA QUALITY ASSURANCE

As part of its internal quality assurance process, the EPA routinely conducts peer reviews of its work to measure not only the accuracy of its monitoring and testing regime, but also to ascertain whether the methods being used are sound and appropriate to the situation at hand.

In response to the Hazelwood mine fire, the EPA sought peer reviews on the following topics:

Review of Process for Public Health Protection (Carbon Monoxide Response Protocol), by:

- Professor Ross Anderson, Professor of Epidemiology and Public Health, St Georges, University of London and Kings College London
- Dr Fay Johnston, Senior Research Fellow, Environmental Epidemiology, Menzies Research Institute Tasmania, University of Tasmania.

Review of Air Quality Assessment and Monitoring Programs, by:

- Associate Professor Howard Bridgman, Conjunct Professor, School of Environmental and Life Sciences, University of Newcastle.

Review of Soil and Ash Monitoring and Assessment, by:

- Dr Robert Edis, Certified Professional Soil Scientist, Honorary Associate Professor, University of Melbourne.

Review of Water Monitoring and Assessment, by:

- Dr Vincent Pettigrove, Chief Executive Officer, Principal Research Fellow, Centre for Aquatic Pollution Identification and Management.[111]

Associate Professor Bridgman was asked to review the EPA's approach to monitoring and testing of $PM_{2.5}$ by using Environment Tasmania's TravelBLANkET, and to assess the accessibility of the information provided by the EPA on its website. His advice was that the EPA was 'monitoring the right things in the right places to provide appropriate and timely information and updates.'[112]

Associate Professor Bridgman's views on the information provided on the EPA's website, and the website's accessibility, are discussed in Part 5 Communications.

Dr Edis's advice was that the EPA's soil and ash monitoring program was suitable pending some expansion of testing, including sampling of edible above ground plant parts, with and without rinsing, and sampling of surface soil in plume paths where there is high potential for human exposure.[113]

Dr Pettigrove's advice was that the water monitoring program included a good selection of sites and the EPA was undertaking a suitable program to assess the impact of fire on the local water quality.[114]

Discussion on the peer reviews sought on the Carbon Monoxide Response Protocol is detailed in Chapter 4.6 Health response.

ANIMALS – PETS AND AGRICULTURE

Many people in the Latrobe Valley expressed concern about the effects the Hazelwood mine fire had, and could have, on domestic pets and agriculture. People in the community reported that their pets and animals were covered in soot and ash and displayed symptoms of lethargy and dizziness. Many people sought veterinary help to treat sick pets.

Ms Lisa Wilson, Gippsland Homeless Network Coordinator at Quantum, described to the Board the effects of smoke and ash on her pets when they moved from Morwell: 'The change in the cats was… immediate, their coats changed colour and they were no longer so sedate.'[115]

DISCUSSION AND CONCLUSIONS

On 11 February 2014, the State Control Centre made a request to the EPA that it provide support and advice in responding to the Hazelwood mine fire. In the Board's view, the request came too late. Carbon monoxide and smoke were emitted from the fire from 9 February 2014.

The monitoring conducted by the EPA from 13 February 2014 onwards at Hourigan Road, Morwell (East) provided valuable data. However, the Board accepts the opinion of independent air pollution expert Ms Richardson that the location of this monitoring station was not representative of the acute impacts likely to have affected the community located closer to the mine site from 9 February to 20 February 2014.[116]

The Board commends the monitoring conducted by the EPA from 20 February 2014 onwards at the Morwell Bowling Club (South), and accepts the opinion of air pollution expert Ms Richardson, that it was both extensive and of high quality. This enabled the EPA to provide detailed data to the Department of Health to assist in its decision-making.[117] The Board notes that this monitoring will also help to inform future studies on air quality impacts from the Hazelwood mine fire.

There were some delays in establishing and maintaining monitoring at various locations in Morwell and the surrounding areas due to the availability and serviceability of monitoring equipment. The EPA also experienced technical difficulties in testing soil, ash and water.

The Board commends the EPA for working assiduously to overcome equipment deficiencies, and moving as swiftly as it could to obtain equipment from wherever it could. The Board notes that the majority of the air quality monitors used by the EPA in response to the Hazelwood mine fire are sensitive, high quality pieces of equipment, and commissioning such monitors would usually take days if not a week or more to set up properly in order to log air quality data accurately.

The Board considers that monitoring during the initial period of the incident could have been improved by the use of portable instruments. Rapidly deploying low cost, highly mobile monitoring equipment that is calibrated and ready for deployment would have alleviated the pressure the EPA experienced. Having such equipment on hand would have allowed monitoring to have commenced earlier on in the critical period of the first week when the highest air pollution concentrations were likely to have affected the community. Based on the evidence provided, the Board considers that the EPA should have been in a position to respond to this event within 24 hours of the request.

Further, portable monitoring that has the capacity for remote downloading via a modem to allow for rapid access to data was needed. Having this in place would have provided data in the required format earlier on.

The EPA did not have the right equipment to rapidly establish data gathering and analysis for air quality monitoring and testing.[118] Based on the information available the Board is concerned that the EPA was ill-equipped to respond. The Board affirms the Victorian Government's intention to clarify future expectations of incident air monitoring and scenarios, and determine the appropriate inventory of equipment, and to review EPA emergency protocols, incorporating lessons from the Hazelwood mine fire.[119]

The EPA holds itself to the highest levels of scientific rigour and quality assurance. It does this by ensuring accuracy of data readings through testing and calibrating its equipment, having data results checked internally, and by conducting external peer reviews of its monitoring and testing regime.

The approach taken by the EPA in relation to requesting interim results was sensible and is to be expected in a scenario such as this one. The approach taken by the EPA in relation to indicative data, on the other hand, could have been improved.

There is merit in using indicative data in emergency response situations, rather than waiting many days for data logged through a permanent monitoring station. The Board considers that the need for timely data overrides the necessity for provision of data that is fully compliant with the National Ambient Air Quality standard. This means that less accurate data obtained sooner would have been more valuable than data that was quality assured but took longer to produce. The Board accepts the opinion of the independent expert on this point.

The Board considers that agencies should have acted on data available in the first week that showed significant, potentially dangerous emissions from the mine likely to affect the people of Morwell. In its response to the Hazelwood mine fire, the EPA put scientific rigour over and above the flexibility it needed to respond with less precise mobile equipment.[120]

The Board supports the EPA's continued air monitoring in the Latrobe Valley and in particular Morwell.

Exposure to air pollutants is largely beyond the control of individuals and requires action by public authorities.

The Board considers that it is essential that the $PM_{2.5}$ advisory standard be converted into a compliance standard and recommends that the State take the lead in advocating for this standard. The Board supports the development of the compliance standard through an amendment to the National Ambient Air Quality standard as proposed by the EPA. It considers that the proposed amendment will assist in providing a level of health protection against the impacts of particle air pollution for the Australian community and encourages the amendment to be made promptly. This is in line with the EPA's intention to monitor $PM_{2.5}$ at all of its fixed automatic air quality monitoring locations by the end of July 2014.[121]

The Board affirms the Victorian Government's intention to review the State Ambient Air Quality standard.[122]

RECOMMENDATION 5

The State equip itself to undertake rapid air quality monitoring in any location in Victoria to:

- collect all relevant data, including data on $PM_{2.5}$, carbon monoxide and ozone; and
- ensure this data is used to inform decision-making within 24 hours of the incident occurring.

RECOMMENDATION 6

The State take the lead in advocating for a national compliance standard for $PM_{2.5}$.

1. Exhibit 32 – Statement of John Merritt, para. 18
2. *Environment Protection Act 1970* (Vic), s. 5
3. Exhibit 32 – Statement of John Merritt, para. 18
4. Exhibit 32 – Statement of John Merritt, para. 21
5. Exhibit 32 – Statement of John Merritt, para. 21
6. *Environment Protection Act 1970* (Vic), s. 13(1)(k)
7. Exhibit 32 – Statement of John Merritt, para. 58
8. Exhibit 32 – Statement of John Merritt, para. 19
9. Environment Protection Authority 2014, *EPA Ambient Air Monitoring Stations*, EPA, Melbourne, viewed 9 July 2014, http://www.epa.vic.gov.au/our-work/monitoring-the-environment/air-quality-bulletins/epa-ambient-air-monitoring-stations
10. Exhibit 40 – Supplementary expert report of Claire Richardson, paras 29 & 30
11. Exhibit 32 – Statement of John Merritt, para. 73
12. Exhibit 32 – Statement of John Merritt, para. 73
13. Torre T989:28 – T990:14
14. Exhibit 32 – Statement of John Merritt, paras 84-88
15. Exhibit 55 – Statement of John Mitchell, paras 128-133; Written submission of the Latrobe City Council, attachments 2 & 3
16. Exhibit 55 – Statement of John Mitchell, paras 128-133; Written submission of the Latrobe City Council, attachments 2 & 3
17. Exhibit 32 – Statement of John Merritt, para. 89
18. Exhibit 32 – Statement of John Merritt, para. 9
19. Exhibit 32 – Statement of John Merritt, para. 24
20. Exhibit 32 – Statement of John Merritt, paras 17 & 113
21. Exhibit 32 – Statement of John Merritt, para. 9
22. Exhibit 32 – Statement of John Merritt, para. 203
23. Adapted from Exhibit 85 – Material provided by the EPA, environmental sampling around Morwell, p. 2
24. Adapted from Exhibit 85 – Material provided by the EPA, environmental sampling around Morwell, pp. 1-2
25. Adapted from Exhibit 85 – Material provided by the EPA, environmental sampling around Morwell, p. 3
26. Adapted from Exhibit 85 – Material provided by the EPA, environmental sampling around Morwell, p. 4
27. Exhibit 32 – Statement of John Merritt, Appendix Two
28. Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft)
29. Exhibit 32 – Statement of John Merritt, para. 114; Appendix Two
30. Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft)
31. Exhibit 32 – Statement of John Merritt, Appendix Two
32. Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft)
33. Exhibit 32 – Statement of John Merritt, Appendix Two
34. Torre T958:22-28
35. Exhibit 32 – Statement of John Merritt, Appendix Two
36. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p.5
37. Exhibit 36 – Expert report of Claire Richardson, pp.10 & 11
38. Torre T974:24-30
39. Exhibit 37 – California Guide for Public Health Officials, p. 24
40. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 5
41. Exhibit 41 – Joint report of Claire Richardson and Paul Torre, para. (d)
42. Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 5
43. Exhibit 41 – Joint report of Claire Richardson and Paul Torre, para. (d)
44. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 4
45. Exhibit 41 – Joint report of Claire Richardson and Paul Torre, para. (c)
46. Torre T973:6-28
47. Adapted from Exhibit 85 – Material provided by the EPA, hourly average $PM_{2.5}$ levels at Morwell (South) (February – March 2014) produced by the EPA
48. Victorian Government Documents, 22 May 2014, Explanation of TRAVELBLANkET results of sampling 22 February 2014 (EPA.0010.004.0332)
49. Exhibit 86 – Maps provided by John Merritt in a meeting with Latrobe City Council on 28 February 2014
50. Victorian Government Documents, 22 May 2014, Explanation of travel blanket results of sampling on the 22nd February (EPA.0010.004.0332)
51. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 4
52. Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 1
53. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood Coal Mine Fire – Air Quality Monitoring Report (draft), p. 6
54. Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 6
55. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 6
56. Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 6
57. Exhibit 32 – Statement of John Merritt, para. 138
58. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire – air quality monitoring report (draft), p. 6

59. Exhibit 85 – Material provided by the EPA, Hazelwood Coal Mine Fire – Air Quality Monitoring Report (draft), p. 6
60. Exhibit 40 – Supplementary expert report of Claire Richardson, para. 13
61. Exhibit 40 – Supplementary expert report of Claire Richardson, para. 14
62. Exhibit 40 – Supplementary expert report of Claire Richardson, para. 11
63. Exhibit 41 – Joint report of Claire Richardson and Paul Torre, para. (b)
64. Exhibit 41 – Joint report of Claire Richardson and Paul Torre, para. (b)
65. Exhibit 38 – Second statement of Paul Torre, para. 4
66. Exhibit 38 – Second statement of Paul Torre, para. 5
67. Exhibit 38 – Second statement of Paul Torre, paras 16-17
68. Torre T967:31 – T968:2
69. Exhibit 32 – Statement of John Merritt, para. 174
70. Exhibit 41 – Joint report of Claire Richardson and Paul Torre, para. (e)
71. Exhibit 32 – Statement of John Merritt, para. 154(a)
72. Exhibit 32 – Statement of John Merritt, para. 154(g)
73. Exhibit 32 – Statement of John Merritt, para. 154(h)
74. Exhibit 32 – Statement of John Merritt, para. 154(b)
75. Exhibit 32 – Statement of John Merritt, para. 154(c)
76. Exhibit 32 – Statement of John Merritt, para. 154(d)
77. Exhibit 32 – Statement of John Merritt, para. 154(e)
78. Exhibit 32 – Statement of John Merritt, para. 154(f)
79. Exhibit 32 – Statement of John Merritt, para. 160
80. Torre T1000:17-27
81. Exhibit 32 – Statement of John Merritt, para. 55.5
82. Exhibit 32 – Statement of John Merritt, para. 42
83. Exhibit 39 – Expert report of Claire Richardson, para. 36; Richardson T1026:25 – T1027:6
84. Exhibit 40 – Supplementary expert report of Claire Richardson, para. 11
85. Exhibit 41 – Joint report of Claire Richardson and Paul Torre, para. (e)
86. Exhibit 32 – Statement of John Merritt, para. 163
87. Exhibit 38 – Statement of Paul Torre, para. 40; Torre T974:24-30
88. Burke T1372:19-22
89. Torre T951:24-26
90. Adapted from Exhibit 32 – Statement of John Merritt, paras 124 & 125
91. Exhibit 32 – Statement of John Merritt, paras 96 & 97
92. Burke T1370:14 – T1371:30
93. Exhibit 32 – Statement of John Merritt, para. 139
94. Exhibit 32 – Statement of John Merritt, para. 147; Detailed soil samples can be found at Exhibit 32 – Statement of John Merritt, para. 151 attachment, Soil and Ash Results and Graphs (EPA.007.002.0183)
95. Exhibit 32 – Statement of John Merritt, para. 156
96. Exhibit 32 – Statement of John Merritt, para. 139
97. Exhibit 32 – Statement of John Merritt, para. 149
98. Exhibit 32 – Statement of John Merritt, paras 158 & 159
99. Exhibit 32 – Statement of John Merritt, para. 150; Detailed ash results can be found at Exhibit 32 – Statement of John Merritt, para. 151 attachment, Soil and Ash Results and Graphs (EPA.007.002.0183)
100. Adapted from Exhibit 32 – Statement of John Merritt, para. 150
101. Exhibit 85 – Material provided by the EPA, environmental sampling around Morwell, p. 4
102. Exhibit 32 – Statement of John Merritt, para. 142
103. Exhibit 32 – Statement of John Merritt, para. 145
104. Exhibit 32 – Statement of John Merritt para. 139
105. Exhibit 32 – Statement of John Merritt, para. 155
106. Detailed results of water testing can be found at Exhibit 32 – Statement of John Merritt, para. 151 attachment, Soil and Ash Results and Graphs (EPA.007.002.0183)
107. Exhibit 32 – Statement of John Merritt, para. 144
108. Detailed results of water testing can be found at Exhibit 32 – Statement of John Merritt, para. 151 attachment, Soil and Ash Results and Graphs (EPA.007.002.0183)
109. Exhibit 32 – Statement of John Merritt, para. 146
110. Adapted from Exhibit 85 – Material provided by the EPA, environmental sampling around Morwell, p. 3
111. Exhibit 32 – Statement of John Merritt, para. 109
112. Exhibit 32 – Statement of John Merritt, Appendix Three, Peer Reviews (EPA.0001.007.0010)
113. Exhibit 32 – Statement of John Merritt, Appendix Three, Peer Reviews (EPA.0001.007.0014)
114. Exhibit 32 – Statement of John Merritt, Appendix Three, Peer Reviews (EPA.0001.007.0016)

115. Exhibit 87 – Statement of Lisa Wilson, para. 30
116. Exhibit 40 – Supplementary expert report of Claire Richardson, para. 22
117. Exhibit 40 – Supplementary expert report of Claire Richardson, para. 22
118. Torre T949:24-28; T974:2-9
119. Second written submission of the Victorian Government, 18 June 2014, paras 6.3 & 6.12
120. Exhibit 32 – Statement of John Merritt, paras 41 & 47
121. Third written submission of the Victorian Government, 23 June 2014, para. 139
122. Second written submission of the Victorian Government, 18 June 2014, para. 6.25

4.4 FIREFIGHTER HEALTH

OVERVIEW

This Chapter describes the immediate health risks to firefighters during the Hazelwood mine fire, and considers the methods employed by fire services, GDF Suez and the Victorian WorkCover Authority to minimise these risks. The reference to firefighters in this Chapter where not otherwise specified refers to firefighters from the Metropolitan Fire Brigade, the Department of Environment and Primary Industries, employees and volunteers from the Country Fire Authority, and firefighters from the Hazelwood mine, including GDF Suez employees and contractors.

Under its Terms of Reference the Board of Inquiry is required to examine the adequacy and effectiveness of the response to the Hazelwood mine fire by GDF Suez, emergency services, and other relevant government agencies and any other matter that is reasonably incidental to this. This Chapter addresses those aspects of the Terms of Reference.

Over the course of the Hazelwood mine fire, a number of firefighters from the fire services and GDF Suez required medical treatment. Fourteen fire service firefighters and 12 GDF Suez staff presented to hospital due to exposure to carbon monoxide. However none required admission. A firefighter was admitted to hospital due to a cut that subsequently became infected and another firefighter was injured activating a water spray in the mine. A number of firefighters required first aid at the mine throughout the fire.

During the Hazelwood mine fire, exposure to elevated levels of carbon monoxide was a key risk for firefighters. Carbon monoxide is produced during the incomplete combustion of coal and can cause symptoms such as headache, dizziness, weakness, nausea, vomiting, chest pain and confusion. Carbon monoxide cannot be detected without appropriate equipment.

To counter this risk, fire services developed and implemented a number of procedures throughout the fire. The Draft Carbon Monoxide Regional Operating Procedure (developed in 2006) was initially utilised, with additional measures incorporated to form the Health Management and Decontamination Plan.

GDF Suez had a carbon monoxide procedure in place to manage the risk of exposure to carbon monoxide during a mine fire. It also utilised the fire services' carbon monoxide procedures and subsequently the Health Management and Decontamination Plan.

The Board of Inquiry received submissions from the United Firefighters Union and Volunteer Fire Brigades Victoria, which raised a number of concerns about the health risks faced by firefighters during the mine fire. Both groups submitted that the Country Fire Authority, the Metropolitan Fire Brigade and GDF Suez failed to recognise the potential health risks to those involved in the fire operations, particularly from exposure to carbon monoxide. The Board also heard from fire services members and GDF Suez about the firefighting conditions during the fire and responses to these concerns. The health impacts of exposure to carbon monoxide were explained by the expert witness engaged by the Board, Professor Donald Campbell, Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health.

The Board considers that better mechanisms should have been in place to protect firefighters from the risks of exposure to carbon monoxide. The Board considers that there was a delay in implementing safety procedures to protect the firefighters from the risk of exposure to carbon monoxide. The development of the Health Management and Decontamination Plan assisted in managing the risk to firefighters. However, it did not give adequate regard to firefighters who may have been particularly vulnerable to adverse health effects from exposure to carbon monoxide. The fact that the Draft Carbon Monoxide Regional Operating Procedure had not been finalised since 2006 is of concern.

FIREFIGHTING AT THE HAZELWOOD MINE

The nature of firefighting means that firefighters are deliberately placed in hazardous, often uncontrolled conditions that expose them to a number of risks. For this reason it is very important to have adequate training and policies in place to ensure that the safety of firefighters is protected to the extent that is reasonably practicable.

Due to the size of the Hazelwood mine fire, the length of time that the coal burned, the gases produced by the fire, and the location of the fire within the coal mine, firefighters and other mine staff were exposed to multiple hazards.[1] In particular, the mine fire generated potentially hazardous emissions, including carbon monoxide, particulate matter, and volatile organic compounds (for example, benzene) and ozone.

Over 7,000 fire service firefighters and 200 mine employees and contractors battled the mine fire.[2] They acted courageously for 45 days in difficult conditions to contain the fire, until it was declared safe on 25 March 2014 (see Figure 4.39).

Figure 4.39 Firefighters at the Hazelwood Power Station

Image source *Fairfax Syndication*

On 13 February 2014 (four days after the fire in the mine started), Mr Craig Lapsley, Fire Services Commissioner, determined that the mine fire should have a HazMat (hazardous materials and items) overlay applied to operations. A HazMat overlay influences the way that an event is dealt with by emergency services.[3]

Mr Lapsley told the Board that this decision was taken because firefighters were being exposed to carbon monoxide, and that:

> …our firefighters were treating this in [sic] a structural type fire and not using hazardous materials type procedures. We needed to emphasise to the firefighters the hazardous materials type nature of this, that it was generating other things than just smoke and ash.[4]

ADVERSE HEALTH EFFECTS

There is always a risk of injury to firefighters during fire suppression efforts.

Over the course of the Hazelwood mine fire, a number of firefighters received first aid treatment. Mr Lapsley told the Board that 15 fire services firefighters presented to hospital, however none were admitted. Fourteen of these 15 firefighters presented to hospital for carbon monoxide poisoning.[5] Mr Steven Harkins, GDF Suez Director of People, Culture and Environment, told the Board that 12 mine staff were sent to hospital due to initial high carbon monoxide readings but none were admitted.[6] A number of firefighters from fire services and the mine experienced low level carbon monoxide exposure, however did not require hospital treatment.[7]

The number of individuals who experienced symptoms consistent with carbon monoxide poisoning, but did not attend hospital, is unknown.

A number of other health impacts due to the mine fire were reported. A firefighter was admitted to hospital after a small cut sustained during his firefighting efforts at the mine became infected. He underwent multiple surgeries but has recovered.[8] On 9 February 2014, a firefighter was injured activating a spray in the northern batters which resulted in several broken teeth.[9]

A firefighter narrowly avoided injury after coal dislodged and fell around him while firefighting in the mine.[10]

The firefighting conditions also caused a number of firefighters to suffer extreme tiredness and exhaustion, especially in the first few days of the fire when they were required to work long shifts.[11]

CARBON MONOXIDE EXPOSURE

The risk of carbon monoxide exposure has been identified as a key risk in fires, particularly coal mine fires.[12] The primary risk to firefighters during the Hazelwood mine fire was exposure to carbon monoxide.

Without monitoring equipment, firefighters can be exposed to high levels of carbon monoxide without knowing. This not only compromises their own health and effectiveness, but puts their colleagues at risk if they need to attend to and evacuate an affected firefighter.

Symptoms of carbon monoxide exposure include headache, dizziness, weakness, nausea, vomiting, chest pain and confusion.[13] At extreme levels carbon monoxide exposure can lead to death.[14]

The presence of carbon monoxide in the air is measured in parts per million (ppm). However, the effect of carbon monoxide exposure on a person is determined by the percentage of carboxyhaemoglobin in the blood.

Carbon monoxide at high levels is acutely toxic to all; however some groups are more vulnerable to the effects. For example, older people and people with chronic cardiovascular and respiratory disease are less likely to be able to cope with the insult.[15] Breathing carbon monoxide during pregnancy can cause miscarriage.[16] The Country Fire Authority (CFA) does not retain comprehensive medical information about all its volunteers.[17] Whether CFA volunteers have a pre-existing cardiovascular or respiratory condition, or are pregnant and therefore carry a greater risk if exposed to carbon monoxide, is unknown.

DRAFT CARBON MONOXIDE REGIONAL OPERATING PROCEDURE

During a previous fire at the Hazelwood mine in 2006, a number of firefighters experienced symptoms consistent with carbon monoxide poisoning. The CFA report into the 2006 fire noted that 'any similar fires in the future will require the careful management of this known risk.'[18] Following this fire, and a further fire in 2008, the CFA developed a document entitled 'Draft Regional SOP – Latrobe Valley Open Cut Coal Mines – Response to Fires (Draft Carbon Monoxide Regional Operating Procedure)' that outlined a graded system of work arrangements to control firefighter exposure to carbon monoxide.[19]

The Draft Carbon Monoxide Regional Operating Procedure remained in draft form for eight years between 2006 and the commencement of the Hazelwood mine fire in February 2014.

Mr Lapsley accepted that it should have been a priority of the CFA to finalise the Draft Carbon Monoxide Regional Operating Procedure promptly, to ensure that it was available for future incidents where there was a risk of carbon monoxide exposure.[20]

EMERGENCY SERVICE RESPONSE TO CARBON MONOXIDE RISK AT THE MINE

On 9 February 2014, a number of firefighters were deployed to areas of the Hazelwood mine without breathing apparatus or personal carbon monoxide detectors.[21]

Protocols about the protection of firefighters from the risks of exposure to carbon monoxide were not implemented until late in the evening on 9 February 2014. By this time a number of firefighters had already been exposed to increased levels of carbon monoxide that were generated by the mine fire.

Mr Doug Steley, CFA Volunteer, attended the mine fire at approximately 10 pm on 9 February 2014. He told the Board that when he arrived at the mine he was provided with limited information about potential exposure to carbon monoxide. He was given a carbon monoxide monitor for his Unit and told that an alarm would go off continually if they needed to evacuate. However, he was not told what the alarm sounded like.[22] On 11 February 2014, Mr Steley attended a local hospital emergency department with a mild headache.[23] He did not require admission to hospital.

On 10 February 2014, fire services developed a carbon monoxide procedure at the mine. The Board was provided with an incident plan for the day shift, which included the following information:

- all crews to have access to carbon monoxide monitoring
- total withdrawal at 200 ppm.[24]

Following this, Mr Ross Male, CFA Division Commander at the mine, noted arrangements to rotate work shifts to reduce the time firefighters spent in the mine. He also noted arrangements to monitor carbon monoxide in the environment, and to monitor the carboxyhaemoglobin levels of individual firefighters.[25]

The fire services Health Support Team then implemented the Draft Carbon Monoxide Regional Operating Procedure developed after the 2006 and 2008 fires.[26]

The Draft Carbon Monoxide Regional Operating Procedure provided that firefighters with a carboxyhaemoglobin level:

- less than five per cent were able to work their full shift
- between five per cent and seven per cent were unable to work and were excluded from the site for 24 hours
- greater than eight per cent were referred to Ambulance Victoria for assessment.[27]

The Draft Carbon Monoxide Regional Operating Procedure also set a standard for carbon monoxide concentrations in the air and what action should be taken (see Figure 4.40).

Figure 4.40 Carbon monoxide ambient air levels - Latrobe Valley open cut coal mine[28]

Carbon monoxide ambient air level	Action
Below 30 ppm	• No restriction to personnel undertaking continuous work for a period of up to 8 hours
In excess of 30 ppm	• The Incident Controller must be notified • Ongoing monitoring of carbon monoxide must be undertaken in the area and the readings must be logged with the Incident Controller • The Incident Controller must notify the Health Support Team Manager and/or Scientific Officer and will be advised of the maximum time that personnel can remain in the environment • The Health Support Team Manager will liaise with the CFA Medical Officer • The parent mine company must be requested to provide a Company Health Representative
In excess of 200 ppm	• The Incident Controller must be notified immediately • All personnel in the area must immediately leave the area • Ongoing carbon monoxide concentrations must be undertaken to determine the extent of the area affected and concentration encountered • The Incident Controller will immediately notify the Health Support Team and/or Scientific Officer and will be advised of the maximum time personnel can remain in the environment and the duration of rest periods that must be undertaken prior to re-entry

On the evening of 11 February 2014, following a report that several firefighters had presented to the Sale Hospital for possible carbon monoxide exposure, the Incident Controller suspended firefighting in the mine pending review of the safe work arrangements.[29] Mr Lapsley told the Board that from this moment on his personal attention was focused on ensuring that the management of carbon monoxide exposure in the mine was correct.[30]

On 12 February 2014, the CFA received advice from an occupational hygienist, Mr Robert Golec from AMCOSH Pty Ltd, Mr Mike Smith, Deputy Chief Officer of the South Australian Metropolitan Fire Service, and Dr Michael Sargeant, the CFA Medical Officer, about the risk of carbon monoxide exposure. Around this time, Mr Lapsley advised that pregnant women, and those with pre-existing heart and lung disorders, should not be deployed to the mine.[31]

On the evening of 12 February 2014, the Incident Controller implemented an upgraded carbon monoxide system of work based on the advice of the occupational hygienist and interstate experts. The new system of work required:

- each crew leader to monitor carbon monoxide levels with a personal carbon monoxide monitor
- that carbon monoxide levels be reported to the Division Commander every 15 minutes
- if the ambient carbon monoxide levels exceed 50 ppm firefighters are required to wear breathing apparatus
- if the ambient carbon monoxide levels exceed 75 ppm firefighters are to immediately put on breathing apparatus and leave the area.[32]

On 13 February 2014, Mr Lapsley declared that the Hazelwood mine fire was a HazMat fire.[33]

On 14 February 2014, the carbon monoxide procedures at the mine were formalised into the Health Management and Decontamination Plan. The Health Management and Decontamination Plan was based on the Draft Carbon Monoxide Regional Operating Procedure, and included the upgraded carbon monoxide system of work implemented from the evening of 12 February 2014.

The Health Management and Decontamination Plan was developed specifically for the Hazelwood mine fire and was endorsed by Mr Lapsley, the Chief Officers of the CFA and Metropolitan Fire Brigade (MFB), and the State Emergency Service (SES). The Plan was based on the SafeWork Australia National Occupational Exposure Standard, which allows a worker to be exposed to a maximum average of 30 ppm carbon monoxide for an eight-hour period in order to prevent the worker's carboxyhaemoglobin level exceeding five per cent.[34]

Mr Peter Rau, MFB Acting Chief Officer, described in an email update to firefighters the review process that generated the Health Management and Decontamination Plan as 'a turning point where fire services began to treat Hazelwood not only as a fire, but as a hazardous materials incident, with the associated protocols'.[35]

Figure 4.41 Firefighters at the mine wearing protective face masks

Image source *AAP NewsWire*

The United Firefighters Union (UFU) and Volunteer Fire Brigades Victoria (VFBV) submitted to the Board that many firefighters were unable to comply with the Health Management and Decontamination Plan as the requirements were impractical, or because they did not have the available equipment (specifically, carbon monoxide monitors). There was also confusion about the standards and the accuracy of the carbon monoxide measurements.[36]

Mr Lapsley accepted that there was a delay in implementing the Health Management and Decontamination Plan and that the changes in the way the carbon monoxide exposure was managed during the initial stages of the fire had the potential to make it confusing for firefighters.[37]

A further concern was raised about the threshold level of five per cent carboxyhaemoglobin used in the Health Management and Decontamination Plan.[38] The World Health Organisation (WHO) recommends a threshold of 2.5–3 per cent carboxyhaemoglobin.[39] However, the WHO standard applies to the community, not a workplace (where exposure is limited to the period of time at work and it is assumed that the employees are healthy).

GDF SUEZ RESPONSE TO CARBON MONOXIDE RISK AT THE MINE

GDF Suez also had firefighters, other employees and contractors at the mine who were exposed to the same risks during the fire, in particular elevated carbon monoxide levels.

Following the 2006 mine fire, GDF Suez conducted an investigation, which concluded that a procedure should be developed for dealing with carbon monoxide during firefighting.[40] A carbon monoxide procedure was developed and included in the Hazelwood Mine Fire Instructions (issued 27 July 2011), and was in place at the time of the Hazelwood mine fire.[41] The carbon monoxide procedure stated that the maximum exposure for an individual to carbon monoxide was 200 ppm over two to three hours, and 30 ppm over eight hours. The carbon monoxide procedure contained no guidance about safe levels of carboxyhaemoglobin generally or for susceptible individuals (those with pre-existing cardiovascular and respiratory disease or pregnancy).

Mr Harkins told the Board that GDF Suez had developed a further informal protocol which required all staff to have a carbon monoxide monitor, known as a 'canary', when entering the mine during a fire. The canary monitors carbon monoxide levels in accordance with the carbon monoxide procedure.[42]

During the Hazelwood mine fire GDF Suez firefighters were also required to comply with the emergency services Draft Carbon Monoxide Regional Operating Procedure and subsequently the Health Management and Decontamination Plan.

GDF Suez firefighters had their carboxyhaemoglobin levels tested before entering and when leaving the mine. A number of GDF Suez firefighters received first aid (including oxygen therapy) and 12 GDF Suez staff were sent to hospital as a result of high carboxyhaemoglobin levels, however none were admitted.[43]

OCCUPATIONAL HEALTH AND SAFETY REQUIREMENTS

Under the *Occupational Health and Safety Act 2004* (Vic) (OHS Act) an employer must (as far as reasonably practicable) provide and maintain a working environment that is safe and without risks to health.[44] Section 23 of the OHS Act imposes a similar duty on employers to safeguard people other than employees including volunteers whose health and safety is affected by the conduct of the employer's undertaking. This can be a difficult task when the nature of the employment places employees in hazardous situations, such as a mine fire.

The Victorian WorkCover Authority (VWA) is responsible for ensuring that employers provide a safe working environment for employees and other people on a worksite. In 2009, VWA undertook a risk ranking prioritisation of all mine sites in Victoria. Hazelwood mine was ranked as one of the highest risk sites.[45]

The Safe Work Australia Hazardous Substances Information System lists carbon monoxide as a hazardous substance. However there is no general ambient air quality standard contained in the OHS Act.[46] The workplace exposure standard for carbon monoxide is an eight-hour time weighted average of 30 ppm.[47] The exposure standard assumes that the level of 30 ppm is equivalent to a five per cent carboxyhaemoglobin level in the blood.[48]

On 11 February 2014, VWA attended the Hazelwood mine to investigate if the worksite provided a safe environment for the mine employees, firefighters and other visitors to the mine. The focus of this visit was on the stability of the batters. However, VWA observed that there was a carbon monoxide monitoring procedure in place.[49]

On 13 February 2014, VWA was notified that a firefighter at the mine had been exposed to carbon monoxide. A VWA occupational hygienist was sent to the mine the next day and observed the application of the Draft Carbon Monoxide Regional Operating Procedure. It was determined that the system of work at the mine reduced so far as reasonably practicable, the risk to firefighters from carbon monoxide exposure.[50]

VWA Incident inspectors were sent to the mine again on 21 February 2014 after receiving further notifications of carbon monoxide exposure (that had occurred on 10 February 2014). VWA considered that the work system in place was appropriate and that it was more robust than that observed at the site visit on 14 February 2014 because procedures were now formally documented.[51]

In addition to the concerns about carbon monoxide exposure and water contamination, the UFU indicated that its members had concerns about:

- supervision of firefighters when fighting the mine fire, including the availability of maps and guides within the mine
- amenities provided at the mine and equipment available to the firefighters, including the ability for decontamination and the maintenance of clean/dirty areas
- the availability and practicality of breathing apparatus provided to the firefighters
- fatigue, staffing levels, crewing of appliances and safety officers/sector commanders deployed during the mine fire
- communication between firefighters, the CFA/MFB and the mine operator.[52]

The UFU submitted to the Board that it should make 12 recommendations arising from the concerns of its members.[53] These included recommendations concerning exposure to carbon monoxide, testing of water used during the firefighting efforts, issues around staffing and decontamination procedures, and that the MFB and CFA be audited to ascertain whether they had complied with obligations under the OHS Act.[54] Some of the UFU's proposed recommendations have been addressed in this report, while others are beyond the scope of the Inquiry's Terms of Reference.

The UFU raised concerns with VWA about firefighters being exposed to carbon monoxide. VWA is investigating this complaint.[55] The Board has been provided with no further details about the VWA investigation.

CONTAMINATED WATER

Firefighters fighting the Hazelwood mine fire utilised the mine's reticulated fire services water system to help extinguish the fire. A number of firefighters became concerned about potential adverse health effects as a result of exposure to the water at the mine during fire suppression activities.[56]

One firefighter developed an infected cut which was thought to be due to the use of the recycled water at the mine. A number of MFB firefighters were exposed to the waste water in the Hazelwood Ash Retention Area (HARA) pond at the mine.[57]

On 15 February 2014, the CFA engaged an occupational hygienist, Mr Golec, to review the safety of the water being used at the mine.[58] A number of water samples were taken. Mr Golec determined that the samples met the standards for drinking water in relation to chemical contaminants, but that a sample from the Hazelwood pondage contained a form of blue-green algae that presented a significant health risk.[59] Further studies of the water indicated that the water did not pose an exposure risk but high levels of coliforms and E.coli were detected.[60]

In response to the water-testing results, the CFA issued several hygiene directives to the firefighters, including the use of gloves.

The UFU arranged for water samples from the mine to be independently tested by Bureau Veritas, which reported that the water contained coliforms, E.coli and pseudomonas aeruginosa.[61] Bureau Veritas recommended that firefighters with burns or cuts should not come into contact with the water, that the water should not be ingested or inhaled, that appropriate protective equipment should be worn, and that personal hygiene should be observed (for example, washing hands before eating).[62] This was consistent with the hygiene directives issues by the CFA.

Other than the cut sustained by a firefighter that became infected, there were no other reported adverse health effects to firefighters from the water used during fire suppression operations at the mine.

DISCUSSION AND CONCLUSIONS

The Hazelwood mine fire produced hazardous conditions for firefighters. Fire services and GDF Suez were initially inadequately prepared to respond to the risk of carbon monoxide exposure to firefighters.

The Incident Controller at the Hazelwood mine fire did not implement any protocols for the protection of firefighters from the risks of exposure to carbon monoxide until late in the evening on 9 February 2014. By this time a number of firefighters had already been exposed to the elevated levels of carbon monoxide that were generated by the mine fire and suffered short-term adverse health effects.

To minimise the risk to firefighters, the Draft Carbon Monoxide Regional Operating Procedure (developed after the 2006 mine fire) should have been formalised prior to the Hazelwood mine fire.

On 14 February 2014, the Draft Carbon Monoxide Regional Operating Procedure and other procedures adopted in response to the mine fire were formalised into the Health Management and Decontamination Plan. The Board considers that the exposure standard adopted in this Plan, although higher than that recommended by the WHO's threshold levels of carboxyhaemoglobin, was reasonable given that the mine was a workplace for the fire services and mine employees.

However, the Board considers that the Health Management and Decontamination Plan did not take into account that some firefighters may have had pre-existing conditions, which would have put them at an increased risk of adverse health effects from carbon monoxide exposure. The Board considers that it is important that all firefighters are provided information about the potential risks, particularly for HazMat fires, involved in firefighting so that they can make informed choices.

The Board supports the Victorian Government's intention to improve training for career and volunteer firefighters, and to improve occupational health and safety in emergency response situations.[63]

Although GDF Suez had a policy in place in relation to carbon monoxide risks, this policy did not contain guidance about a safe level of carboxyhaemoglobin for individuals, nor did it contain any guidance for susceptible individuals about exposure to carbon monoxide.

GDF Suez's informal carbon monoxide protocol only dealt with the amount of carbon monoxide in the air, and failed to deal with the effect that carbon monoxide has on individuals by measuring levels of carboxyhaemoglobin.

Overall, the Board considers that the carbon monoxide policy and protocol developed by GDF Suez did not provide adequate protection to the mine's firefighters and operational staff from potential carbon monoxide exposure.

If not for the Health Management and Decontamination Plan, increased carboxyhaemoglobin levels in firefighters would not have been detected until they began to exhibit symptoms, which may have put them at risk of significant adverse health effects.

The Board recommends that the State should revise the firefighter carbon monoxide protocol to ensure that it is consistent with the community carbon monoxide protocol. Any future policy about carbon monoxide exposure should include triggers for action for specific categories, for example relevant to age, pre-existing health conditions and pre-existing risk factors such as smoking. It would also be beneficial for fire services to encourage all firefighters to self-disclose if they have any pre-existing respiratory or cardiac conditions and if females of childbearing age are or could be pregnant. The State's revised carbon monoxide protocol should also be adopted by GDF Suez. It should be finalised by the end of September 2014 and should be reviewed by an independent panel prior to its implementation.

Before deployment, firefighters should be reminded of the risks of carbon monoxide to enable them to make an informed decision. The CFA, MFB and GDF Suez should provide education on the risks of carbon monoxide poisoning to all firefighters during recruitment, selection, training and deployment of both career and volunteer firefighters. The training should include drawing attention to pre-existing conditions that could place firefighters at increased risk.

The Board notes the concerns of the UFU and the recommendations it asked the Board to make. Exposure to carbon monoxide has been addressed in this report, as has the testing of water used during firefighting efforts. An investigation is already being carried out by VWA in relation to MFB and CFA compliance with the OHS Act.[64]

There was evidence provided to the Board that there were safety officers and logistics officers deployed for all but the very earliest firefighting shifts at the mine.[65] There was also evidence produced to the Board that each shift was staffed with a qualified Incident Controller. The Board therefore does not intend to make any recommendation about staffing. With respect to the UFU's suggested recommendation that more firefighters be available for firefighting efforts, the Board acknowledges the evidence of the CFA which indicated that had more resources been available, those resources would have been deployed.[66] The Board also notes and encourages the implementation of the existing emergency services plan for increased numbers of career firefighters.

The Board notes the concerns of the UFU in relation to decontamination procedures to be implemented in firefighting efforts. The Board has received evidence that risk assessments for the Incident Control Centre, staging area and fireground were undertaken by the Incident Controller.[67] Further, the Incident Shift Plans produced requirements for firefighters (and others) to follow the decontamination procedures.

RECOMMENDATIONS

See Chapter 4.6 Health response for recommendations relevant to this Chapter.

1. Exhibit 28 – Written submission of the United Firefighters Union; Written submission of the Volunteer Fire Brigades Victoria
2. Exhibit 1 – Statement of Craig Lapsley, para. 100; Exhibit 29 – Second statement of Steven Harkins, para. 38
3. Exhibit 1 – Statement of Craig Lapsley, para. 128
4. Lapsley T65:8-13
5. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 30
6. Exhibit 29 – Second statement of Steven Harkins, para. 40
7. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 12; Exhibit 29 – Second statement of Steven Harkins, para. 40; Exhibit 29 – Second statement of Steven Harkins, annexure 2
8. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 30 attachment, Report of Hazelwood hand injury (FSC.0011.001.0034)
9. Exhibit 10 – Statement of Steven Harkins, para. 51
10. Exhibit 28 – Written submission of the United Firefighters Union, p. 65
11. Exhibit 28 – Written submission of the United Firefighters Union, para. 3.2.8
12. Exhibit 1 – Statement of Craig Lapsley, para. 175 attachment, IMSS Report to Country Fire Authority – The Morwell Open-Cut Mine Fire 12-19 October, 2006 (CFA.005.001.0209)
13. Exhibit 38 – Statement of Paul Torre, para. 11
14. Exhibit 48 – Expert report of Donald Campbell, p. 3
15. Lester T1139:3-11
16. Exhibit 38 – Statement of Paul Torre, para. 11
17. Lapsley T694:2
18. Exhibit 1 – Statement of Craig Lapsley, para. 175 attachment, IMSS Report to Country Fire Authority – The Morwell Open-Cut Mine Fire 12-19 October, 2006 (CFA.005.001.0209) p. 30
19. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 11
20. Lapsley T682:27 – T684:14
21. Exhibit 24 –Statement of Doug Steley; Written submission of the Volunteer Fire Brigades Victoria
22. Exhibit 24 – Statement of Doug Steley, attachment DS-1
23. Exhibit 24 –Statement of Doug Steley, para. 34
24. Exhibit 1 – Statement of Craig Lapsley, para. 98 attachment, hand-written Incident Action Plan (CFA.0007.001.0001); Exhibit 10 – Statement of Steven Harkins, annexure 14
25. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 10
26. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 11
27. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 11
28. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 11 attachment, draft Regional SOP – Latrobe Valley Open Cut Coal Mines – Response to fires (version 7a) (FSC.0011.0001.0133)
29. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 14
30. Lapsley T698:1-18
31. Exhibit 26 – Supplementary statement of Craig Lapsley, paras 15 & 16
32. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 17
33. Exhibit 1 – Statement of Craig Lapsley, para. 128
34. Exhibit 26 – Supplementary statement of Craig Lapsley, paras 19-21
35. Exhibit 28 – Written submission of the United Firefighters Union, attachment 5.1.22
36. Exhibit 28 – Written submission of the United Firefighters Union; Written submission of the Volunteer Fire Brigades Victoria
37. Lapsley T708:3-11
38. Exhibit 28 – Written submission of the United Firefighters Union, attachment 5.1.14
39. Exhibit 48 – Expert report of Donald Campbell, para. 18
40. Exhibit 13 – Statement of Robert Dugan, annexure 2, p. 11
41. Exhibit 12 – Mine Fire Instructions, p. 18
42. Harkins T731:17-31
43. Exhibit 29 – Second statement of Steven Harkins, annexure 2
44. *Occupational Health and Safety Act 2004* (Vic), s. 21
45. Exhibit 70 – Statement of Leonard Neist, para. 19
46. Exhibit 83 – Letter from VGSO dated 10 June 2014
47. Exhibit 83 – Letter from VGSO dated 10 June 2014
48. Exhibit 83 – Letter from VGSO dated 10 June 2014
49. Exhibit 31 – Statement of Robert Kelly, para. 39
50. Exhibit 31 – Statement of Robert Kelly, para. 43
51. Kelly T783:16-29
52. Exhibit 28 – Written submission of the United Firefighters Union, pp. 14–24
53. Exhibit 28 – Written submission of the United Firefighters Union, pp. 24–26
54. Exhibit 28 – Written submission of the United Firefighters Union, pp. 25 & 26, paras 3, 6, 9 & 12
55. Exhibit 28 – Written submission of the United Firefighters Union, attachment 5.1.26

56. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 24
57. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 25
58. Exhibit 26 – Supplementary statement of Craig Lapsley, paras 24–27
59. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 26
60. Exhibit 26 – Supplementary statement of Craig Lapsley, para. 26
61. Exhibit 28 – Written submission of the United Firefighters Union, attachment 5.1.32
62. Exhibit 28 – Written submission of the United Firefighters Union, attachment 5.1.32
63. Second written submission of the Victorian Government, 18 June 2014, paras 4.21 & 4.24
64. Exhibit 28 – Written submission of the United Firefighters Union, p. 25, para. 2; attachment 5.1.26
65. Exhibit 28 – Written submission of the United Firefighters Union, p. 25, paras 4 & 5; Exhibit 15 – Statement of Lawrence Jeremiah, paras 24 & 87; Exhibit 22 – Statement of Robert Barry, para. 15
66. Exhibit 84 – Statement of Steven Warrington, para. 29
67. Exhibit 22 – Statement of Robert Barry, para. 30.2

4.5 HEALTH EFFECTS

OVERVIEW

This Chapter examines the health effects that the smoke and ash produced by the Hazelwood mine fire had on the community, the likely cause of these health effects, and potential long-term health impacts.

Under its Terms of Reference, the Board of Inquiry must consider and report on the adequacy and effectiveness of the response by government agencies to the effects on, and the risks to, the health and wellbeing of communities affected by the Hazelwood mine fire.

The Latrobe Valley community, and in particular Morwell, reported suffering distressing adverse health effects from the Hazelwood mine fire, including sore and stinging eyes, headaches and blood noses. The majority of these symptoms resolved when smoke and ash from the mine fire dissipated, but some residents reported continuing symptoms. In addition to these symptoms, a small number of residents reported developing new health conditions as a result of exposure to smoke and ash during the mine fire. There were a number of vulnerable groups in the community who were particularly susceptible to the potential adverse health effects of the smoke and ash, namely those with pre-existing cardiovascular and respiratory conditions, pregnant women and unborn children, children and the elderly.

The Department of Health monitored the health impact of the mine fire on the community, including undertaking a Rapid Health Risk Assessment. The Department of Health determined that during the Hazelwood mine fire there was an initial increase in demand for general practitioners. However there was not a significant increase in attendances at emergency departments, or other hospital admissions.

The Board of Inquiry heard from a number of community members–through individual submissions, community consultations and evidence given at the Inquiry–who detailed the mine fire's impact on their health and also their concerns about the potential for long-term adverse health impacts. Representatives from the Department of Health informed the Board about the impact of the mine fire on health services.

The Board engaged independent expert, Professor Donald Campbell, Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health to help it better understand the likely cause of the immediate adverse health effects suffered by the community, and the potential for long-term adverse health impacts due to exposure to smoke from the fire.

The Board recognises that the local community suffered extensive short-term adverse health impacts. The Board agrees with Professor Campbell that the probable cause of these adverse health impacts was the smoke and ash produced by the Hazelwood mine fire. The long-term adverse effects of exposure to the smoke and ash from the mine fire are unknown and are of great concern to the community.

The Board commends the Department of Health for commissioning the Rapid Health Risk Assessment and recommends that the Department continue to monitor the physical and psychological health of the community.

HEALTH EFFECTS ON THE COMMUNITY

IMMEDIATE ADVERSE PHYSICAL EFFECTS

The adverse health impacts of the Hazelwood mine fire were significant. The Board heard that from the first day of the fire, residents reported experiencing headaches, sore throats, and were feeling sick.[1] This progressed to sinus and respiratory symptoms.[2] Residents attributed these symptoms to the smoke and ash in and around Morwell and the Latrobe Valley.[3]

The Board heard evidence from a number of community witnesses and received submissions from a number of individuals who reported a variety of physical symptoms suffered during the mine fire.

The symptoms included:

- headaches
- nausea and vomiting
- sore and stinging eyes
- epistaxis (blood noses)
- shortness of breath
- raised blood pressure
- tight chest
- sneezing
- coughing
- tiredness
- raspy voice
- sore throat
- mouth ulcers
- rash
- diarrhoea
- chest pain
- sinusitis
- ear infection
- gastric upset
- fatigue/lethargy
- confusion
- decrease in concentration
- unusual/metallic taste in mouth
- loss of appetite
- bleeding gums.[4]

Ms Lisa Wilson, Gippsland Homeless Network Coordinator at Quantum, provided a statement to the Board, which described her and her partner's symptoms:

> By the second week I was experiencing some difficulty breathing and whistling in my breath... We noticed a change almost immediately on relocating. My partner and I were able to sleep better. We no longer woke up feeling as though our mouths were full of mucous.[5]

Ms Julia Browell of Morwell reported to the Board: 'I became very ill. [I] had major problems breathing, with very sore lungs, throat, ulcers on my tongue & roof of mouth, skin rashes from the incessant dust, diarrhoea, nausea with periods of semi-consciousness and major chest pain.'[6]

On 2 March 2014 at a meeting of local community group Voices of the Valley, a survey of residents' medical symptoms, in the context of the smoke, was conducted.[7] A total of 341 people participated in the survey. The most commonly reported symptoms were flu-like (running nose, sore throat, sinus problems, headaches, itchy eyes). The second most commonly reported symptoms were respiratory in nature, including shortness of breath, wheezing and asthma.[8]

The Australian Nursing and Midwifery Federation also submitted a survey of its members (living and working in Morwell and the Latrobe Valley) to the Board.[9] The survey demonstrated that over 60 per cent of those surveyed suffered adverse health effects during the period that the mine fire was burning.[10] The most common symptoms reported included respiratory and cardiovascular problems, nose bleeds, nausea, headaches, sore/itchy eyes, cough, hypertension and mental health issues. Despite this, only 25 per cent of those who experienced symptoms sought medical attention.[11]

The Board heard that most people found relief from symptoms when they relocated to areas not affected by smoke and ash, but when they returned to smoke-affected areas, their symptoms returned.[12] Ms Julie Brown of Morwell submitted that:

> …when we returned to Morwell the next afternoon, 23rd February and within 30 minutes of getting into town my husband and children were wheezing and I had a headache.[13]

Mr Daniel Caffrey of Morwell informed the Board in his written submission: 'I can now honestly say that my general health has improved since the smoke stopped.'[14] Some residents continue to suffer symptoms. Ms Wendy Sands of Morwell reported that 'even now… 3 months after the initial fire, I am affected by these problems almost daily. I am worried about my health and the health of my family.'[15]

VULNERABLE GROUPS

Independent expert, Professor Donald Campbell, Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health advised the Board that there were a number of groups that were particularly vulnerable to adverse health effects from smoke and ash from the Hazelwood mine fire, in particular people with pre-existing cardiovascular and respiratory diseases, children and the elderly.[16]

As outlined in Chapter 4.1 Health and wellbeing – background, a large proportion of people within the Latrobe Valley community falls within one or more of these vulnerable groups.

PRE-EXISTING CARDIOVASCULAR AND RESPIRATORY DISEASES

Professor Campbell advised that people with pre-existing health conditions, including asthma, chronic obstructive pulmonary disease, ischaemic heart disease and congestive heart failure, were at increased risk from exposure to $PM_{2.5}$, carbon monoxide and ozone.[17] Also at increased risk were smokers who generally have compromised lung function, and people undertaking vigorous activity.[18] Research has shown that individuals with chronic obstructive pulmonary disease have an increased risk of requiring emergency care after exposure to elevated levels of $PM_{2.5}$.[19]

Professor Campbell advised that potential adverse health effects for people with pre-existing cardiovascular and respiratory disease range from exacerbation of their condition, hospital admission, stroke, heart attack and in severe cases, death.[20]

The Board heard from a number of people with pre-existing conditions who were affected by the smoke and ash. Many community members in this group reported an intensification of their symptoms, including increased coughing, breathlessness and lack of energy. Many did not seek additional medical care as they were able to manage their symptoms independently and were aware of the cause. Mr Ray Whittaker of Morwell told the Board: 'I knew why I was coughing more, it was because of the smoke. I did not need to go to a doctor to be told that.'[21]

The following submission from a couple in Morwell describes the impact the smoke and ash had on their health and lives:

> …[my] husband and I both suffer from and with lung disease, and, while we are both able to control our conditions, have suffered a great deal from the impact of the smoke and ash from the Hazelwood Mine Fire. We were virtually prisoners in our own home for at least seven weeks… I was found to be suffering from a bacterial lung infection deemed to be caused as a result from the contaminated air from the fire. My husband who suffers from asbestosis, also succumbed to five days in bed with a severe fever and coughing fit, attributable, we believe, to the mine fire.
>
> We were unable to enjoy any kind of quality of life during those seven to eight weeks and were frightened to go outside without masks and other face coverings. The impact of this event (the mine fire) has left [me] with a continual cough and exacerbated breathlessness, and [my husband] still has coughing fits and some breathlessness on occasions.[22]

PREGNANT WOMEN AND UNBORN CHILDREN

Professor Campbell advised the Board that unborn children were particularly susceptible to high doses of carbon monoxide that can lead to low birth weight, premature labour and foetal death.[23]

Dr Rosemary Lester, Chief Health Officer, told the Board that a pregnant woman's exposure to elevated levels of fine particles may result in a low birth weight for her baby.[24] Dr Lester stated to the Board that this is why she included pregnant women as particularly at risk in her health alert dated 17 February 2014, and in alerts after that date.[25]

The Board heard from pregnant women who were very concerned about the short and long-term impacts of the smoke and ash on their health and the health of their unborn children. Ms Brooke Burke, Morwell Business Owner, told the Board:

> I felt like I was having trouble breathing. I don't know whether it was a bit of anxiety too because it was a pretty stressful day… and I felt quite light-headed and a bit unusual, but I don't know whether that was the air or whether it was just me getting a bit worked up, being pregnant.[26]

Some pregnant women told the Board that although they sought regular medical attention, this did not ease their concerns about their unborn children, as the information provided was insufficient. Ms Wilson told the Board that she regularly attended her general practitioner and the health assessment centre to satisfy herself that she was doing everything she could to protect herself and her unborn child.[27]

Figure 4.42 A pregnant mother and child in Morwell

Image source *Newspix / News Ltd*

CHILDREN

At community consultations members of the community told the Board that they were concerned about the effect of smoke and ash on children, in particular the potential for long-term adverse health effects.[28]

Professor Campbell told the Board that children are more vulnerable to the adverse effects of smoke and ash than adults, but that susceptibility gradually decreases as the child grows.[29] A child's body systems are still developing and therefore are more susceptible to damage from airborne contaminants.[30] Studies have shown that children who have elevated exposure to particulate matter have increased respiratory problems, including decreased lung function and coughing.[31]

Dr Lester also provided information to the Board that, whilst there is no clear dividing line, a child's susceptibility generally decreases as they grow, for example a three year old child would be more vulnerable to the effects of smoke and ash than a five year old child.[32] Children are vulnerable because they have higher breathing rates than adults and therefore inhale more pollutants per kilogram of body weight than adults.[33] Children also tend to spend greater periods of time outside engaging in physical activities and therefore risk greater exposure to contaminants in the air, such as smoke and ash.[34]

The Australian Early Development Index, a measure of how young children are developing in communities, demonstrates that prior to the Hazelwood mine fire, the children of Morwell were functioning below the state average in five key areas: physical health and wellbeing, social competence, emotional maturity, language and cognition skills, and communication skills and general knowledge.[35] As a result, the children of Morwell were particularly vulnerable to the potential adverse effects of smoke and ash from the mine fire.

A number of children's services and primary schools were relocated during the mine fire. Further information about the relocation of schools is in contained in Chapter 4.6 Health response.

THE ELDERLY

As detailed in Chapter 4.1 Health and wellbeing – background, the Latrobe Valley and in particular Morwell, has an ageing population. Consequently, a significant proportion of the community were vulnerable to adverse health effects from smoke and ash.

Dr Lester advised the Board that people over 65 years of age generally have a decreased capacity in their heart and lungs so any strain, for example exposure to smoke and ash, puts them at increased risk compared to a healthy young adult.[36] Older people are also more likely to have pre-existing cardiovascular and respiratory conditions.

Age alone does not make a person vulnerable to ill health. There is no doubt that many healthy people aged over 65 in Morwell are no more vulnerable than the general population to smoke and ash from the Hazelwood mine fire, and that people under 65 years of age may be more vulnerable than their age suggests. Dr Lester accepted that the use of the age 65 was a relatively arbitrary level.[37]

LOWER SOCIO-ECONOMIC STATUS

A further potential group of vulnerable people are those of lower socio-economic status.[38]

Professor Campbell told the Board that whilst he was unable to explain why it is exactly that people of lower socio-economic status are more vulnerable to pollutants, his experience, and epidemiological studies, suggest that they are.[39] Professor Campbell hypothesised that this may be due to inadequacy of nutrition during childhood, which results in a greater risk of impaired lung function development. However he was unable to point to a definitive cause.[40]

Dr Lester told the Board that she was not aware that people who have a lower socio-economic status have a particular vulnerability to pollutants.[41]

HEALTH SERVICES DEMAND

The limited information provided by the Department of Health demonstrated that there was an increase in demand for health services during the mine fire, namely increased presentations to Nurse-On-Call and general practitioners. However, the information appears to relate only to respiratory illnesses and therefore may not be representative of all additional health presentations related to exposure to smoke and ash, for example headaches, nose bleeds and other conditions. Other sources of information were not provided and meaningful comparisons are hard to make.

Dr Christopher Brook, State Health and Medical Commander, reported to the Board that demand for health services arising from the Hazelwood mine fire was manageable, and additional resources were not required.[42] Nevertheless, a health assessment centre was established on 21 February 2014 and operated until 30 March 2014.[43]

The Department of Health monitored the demand for health services relating to respiratory illnesses in the local area during the Hazelwood mine fire. No information relating to demand for general practice consultations was available prior to 28 February 2014, and after that date only subjective trend assessments were provided. The only comparison year given in these assessments was 2013, which may not have been typical. No information was provided to the Board on deaths occurring in the community during the period of the mine fire. No information was provided in relation to consultations at community pharmacies.

The Board heard from a number of community members that they did not seek medical attention, despite suffering a number of distressing symptoms. Dr Brook accepted that the symptoms suffered by members of the local community would not necessarily prompt them to seek medical attention.[44]

NURSE-ON-CALL

Between 9 February 2014 and 10 March 2014, 46 calls were taken by the Nurse-On-Call service that related to respiratory problems, compared with 15 calls for the same period in 2013, and 18 calls for the same period in 2012. These calls were mostly made from localities within Morwell and Traralgon postcode areas.

Almost two-thirds of calls (61 per cent) were queries relating to the health of an adult. Calls were mainly about breathing difficulties (39 per cent), asthma (24 per cent) and cough (24 per cent).[45]

AMBULANCE VICTORIA

Respiratory-related priority dispatches (as a proportion of total dispatches) for the Gippsland region or Morwell area (encompassing localities falling within a 50 kilometre radius of the Hazelwood mine) for the period 9 February–10 March 2014, did not significantly differ from the same period in 2013.

No information was provided to the Board in relation to specific periods during the mine fire when $PM_{2.5}$ levels were very high (ie 15–18 February, 21–25 February and 26–28 February 2014). The only comparison year provided by the Department of Health was 2013, which may not have been typical.[46]

GENERAL PRACTITIONERS

The Department of Health obtained figures in relation to demand for general practitioners during the mine fire by asking general practice managers for their opinions about the level of demand they had experienced.

From 19 February 2014 (10 days after the commencement of the Hazelwood mine fire), general practitioner practices in Morwell, Moe, Churchill and Traralgon reported an increase in consultations related to respiratory conditions (breathing difficulties or asthma, chronic obstructive pulmonary disease (COPD) exacerbation, coughing or throat irritations), anxiety associated with increased smoke and ash, and requests for carbon monoxide testing.[47]

The Board heard from some residents that it was difficult to obtain an appointment with their general practitioner. Ms Wilson explained: 'it's hard to get GP appointments here in the Latrobe Valley because of the lack of medical staff, but in the end that's where I went.'[48]

The Board notes that the Latrobe Valley has fewer general practitioners per 1,000 head of population than the Victorian average.[49]

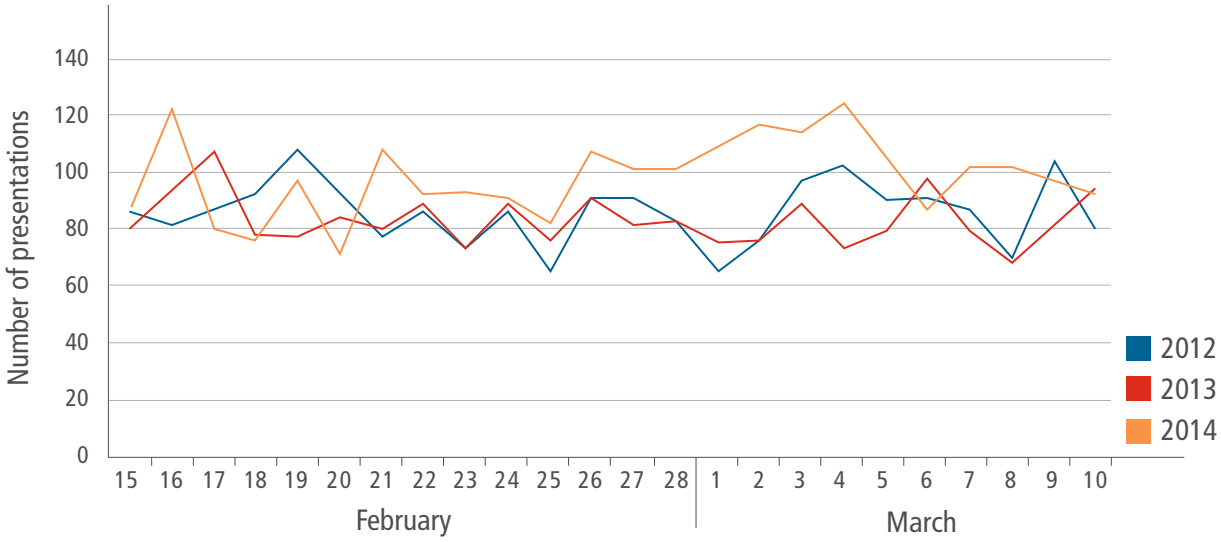
Figure 4.43 General practitioner presentations between 28 February 2014 and 4 April 2014[50]

Figure 4.43 shows that there was increased activity at general practices during the week starting 28 February 2014, but that this gradually subsided. However, Figure 4.43 does not take into account the first few weeks of the fire, the period between 9 February 2014 and 28 February 2014. The Department of Health did not report information relevant to this time period.

HOSPITAL PRESENTATIONS

Between 15 February 2014 and 10 March 2014, the average daily presentations to the Latrobe Regional Hospital emergency department were higher in 2014 compared to previous years (see Figure 4.44). Despite this, average daily presentations were significantly lower for residents of Morwell in 2014, compared to average presentations in 2012 and 2013. That is, during the mine fire, more people attended Latrobe Regional Hospital, however fewer of those patients were from Morwell. The 2014 data may have been incomplete and the data did not account for population changes in the areas over years, or include residents of Morwell who may have presented to other hospital emergency departments.[51]

Figure 4.44 Presentations to Latrobe Regional Hospital 15 February–10 March in 2012 to 2014[52]



No hospitals were required to call a Code Brown (when the health service reduces non-critical incidents in order to manage an unexpected influx of patients) during the mine fire.[53]

Dr Lester commented that 'the comforting thing about this is that we did not fortunately see any severe health effects in terms of increased presentations to hospital, increases in ambulance call outs.'[54]

CAUSE OF HEALTH EFFECTS

Professor Campbell advised the Board that the potential for adverse health effects from exposure to smoke and ash depends on the:

- size of the fire
- effects of heat on combustion
- wind direction and speed
- time of day
- ambient temperature
- nature of the plume
- creation of photochemical smog.[55]

As detailed in Chapter 4.1 Health and wellbeing – background, there were a number of emissions produced during the Hazelwood mine fire that had the potential to cause short-term and long-term adverse health effects.

DURATION AND LEVEL OF EXPOSURE

The Hazelwood mine fire emitted smoke and ash for 45 days. The duration of the community's exposure to smoke and ash is important as it provides an indication to public health officials and the general public about the potential for adverse health effects to occur.

In her statement to the Board, Dr Lester submitted that short-term exposure is generally considered to be from days to weeks, whereas long-term exposure is generally considered to be one year or more.[56] In contrast, Professor Campbell advised that the most widely accepted definition of short-term exposure was exposure for a maximum of 48 hours.[57] Evidently, there is some debate about the precise time periods used to define short-term and long-term exposure.

Dr Lester accepted that the duration of the community's exposure to pollutants due to the Hazelwood mine fire did not fit comfortably into either category of exposure.[58] In her statement she commented that:

> … whilst the short term health effects of short term exposure, and the long term health effects of long term exposure, to smoke are well understood, DH [Department of Health] has identified that there is a gap in medical understanding of the long term health effects from exposure to smoke for a period similar in length to the Hazelwood Coal Mine Fire.[59]

Independent expert Ms Claire Richardson, Managing Director and Principal Consultant, Air Noise Environment Pty Ltd, agreed with Dr Lester that the majority of published studies consider health impacts in terms of short-term exposure and long-term exposure to pollution.[60] There is a lack of academic research about exposure to a coal mine fire and the effects of exposure for the duration seen during the Hazelwood mine fire.[61]

A further issue is the inconsistency of the level of exposure suffered during the 45 days. Dr Lester advised that the air quality was variable throughout the duration of the mine fire.[62] Ms Richardson highlighted that the uniqueness of the event was not only the duration but also that the exposure was not constant and that there were periods of short-term exposure to high concentrations of pollutants.[63]

Professor Campbell aptly described the situation facing the Department of Health in assessing health risks:

> This started as a bushfire but very quickly became a hazardous materials fire in an industrial setting that was of prolonged duration and of intermittent high intensity, and the literature that you go to, to find out what to do, doesn't exist. There is no literature to tell you about this phenomenon, and these exposures are coming in peaks.[64]

Accordingly, it was not only the unusual duration of the event, but also the varying exposure levels during the fire, that added to the complex task of determining the potential short and long-term adverse health effects to the community.

IRRITANT EFFECTS OF SMOKE

As anticipated, a number of community members experienced symptoms such as itchy eyes, sore throat, runny nose and coughing. Dr Lester stated that these symptoms are consistent with smoke irritation.[65] She also stated that healthy adults usually find that where the exposure to smoke is short-term, these symptoms usually clear up once from the person is away from the smoke.[66] Dr Brook told the Board: 'of course we recognise that people are going to face short-term irritation, sore nose, sore eyes, blood noses, dizziness, headache, all very classic symptoms of smoke exposure.'[67]

Professor Campbell agreed that fine particles and larger particles can cause irritation to the eyes and mucous membranes.[68] He advised the Board that whilst he was unable to comment on any specific individual, it is likely that the immediate health effects experienced by affected communities were due to the noxious fumes that residents were exposed to during the fire.[69] Dr Paul Torre, Science Officer at the EPA, was of the same opinion and stated that at very high concentrations of $PM_{2.5}$, people can suffer temporary symptoms such as sore eyes, throat and irritated nose, a dry or productive cough, tightness in the chest and shortness of breath.[70]

In addition to the short-term irritant effects, Dr Lester told the Board that she was concerned that the particulate matter could exacerbate cardiovascular and respiratory disease.[71]

PRESENCE OF CARBON MONOXIDE

Dr Lester told the Board that data provided to the Department of Health about the levels of carbon monoxide in Morwell did not indicate any potential risks to public health.[72] She stated that carbon monoxide exposure is of greater concern in confined spaces and very close to the mine, and that the Department of Health was not anticipating that carbon monoxide would be a risk to the community as it dissipates very quickly.[73]

The Department of Education and Early Childhood Development (DEECD) received a report from Goodstart Early Learning Centre that children were exhibiting symptoms of hyperactivity, headaches, flushed faces and longer sleep times.[74] The Department sought advice from Dr Lester, who replied in an email on 18 February 2014, that the symptoms were consistent with exposure to smoke.[75] Professor Campbell agreed that such symptoms are consistent with exposure to smoke.[76]

ACQUIRED HEALTH CONDITIONS

The Board heard from a small number of individuals who developed new respiratory conditions as a result of exposure to smoke from the mine fire. For example, a local resident, who had not been previously diagnosed with asthma, suffered a severe asthma attack, which resulted in admission to hospital. Another local resident with no pre-existing respiratory illness was diagnosed with 'irritant induced asthma' and 'reactive airways dysfunction syndrome'[77] as a result of exposure to smoke and ash from the Hazelwood mine fire.[78]

Professor Campbell advised the Board that exposure to ozone and $PM_{2.5}$ can induce asthma.[79] Further, recent studies have demonstrated a link between ozone and new asthma in children. If children are exposed to insults (such as ozone) at critical periods during development, the development of the lungs can be arrested and in turn this could trigger asthma.[80]

RAPID HEALTH RISK ASSESSMENT

On 28 February 2014 the Department of Health commissioned the Monash University School of Public Health and Preventative Medicine to undertake a Rapid Health Risk Assessment to provide information about the short-term health effects of the Hazelwood mine fire on the local community. The study, submitted to the Department on 12 March 2014, found that:

- No additional deaths would be expected even if the level of exposure to the measured level of air quality continued for six weeks (using the air quality level at the average exposure in Morwell during the fire – the actual exposure level used was not detailed).
- The principal risks to the health of the Morwell community from the Hazelwood mine fire were fine particles and carbon monoxide.
- There does not appear to be any significant risk from sulphur dioxide.
- The risk from exposure to other air toxic hazards is currently unknown.
- If the fine particles levels remained in the extreme range (over 250 $\mu g/m^3$) for three months this may result in additional deaths in the community.[81]

Dr Lester advised that the study concluded that the level of exposure to smoke and ash experienced by the community in Morwell would not be expected to cause any additional deaths because the level of smoke did not extend for longer than six weeks.[82] However, the study was based on a standard Victorian population and was not adjusted for the poorer health status found in Morwell.[83]

PSYCHOLOGICAL AND SOCIAL EFFECTS

In addition to physical effects on residents, the Board also observed a psychological impact on the community as a consequence of the mine fire. The lack of information about the potential short and long-term effects of the exposure to smoke and ash has caused significant distress to the community. Local general practitioner, Dr Malcolm McKelvie, who works in Yarragon, submitted to the Board that as reports of carbon monoxide monitoring hit the news, people's anxiety levels increased.[84]

Many community members have developed levels of anxiety and depression, which they attribute to the mine fire.[85] Issues raised by community members at community consultations included concern about evident smoke and ash and the generally unpleasant environment during the mine fire, and also the unknown long-term impact of the mine fire to their health. A number of individuals advised that they were afraid to leave their home for the period of time that the mine fire was burning.[86]

Many residents also suffered anxiety and stress from disrupted family life, the loss of enjoyment of their home and neighbourhood, the smell in the air, and because they could not go outside.[87] Mr Darren Geddes of Morwell detailed in his written submission to the Board that his child had become anxious about having to be bussed to a different school.[88] A number of other confidential submissions provided to the Board gave an overview of the anxiety, depression and panic attacks experienced by the community over the duration of the mine fire.

The Board also heard evidence about the broader social effects of the Hazelwood mine fire. Concerns were expressed during community consultations about the potential for an increase in family violence in the short to medium-term as a result of stress caused by the mine fire.[89]

Professor Campbell advised the Board that the whole community, especially young children, are at risk of psychosocial impacts as a result of the emergency, including an increased risk of family violence, drug and alcohol abuse, depression and anxiety, post-traumatic stress disorders and phobias.[90]

The Victorian Council of Social Service (VCOSS) told the Board that social and health impacts of the Hazelwood mine fire will have a profound impact on the Morwell community in the weeks, months and years to come.[91]

In light of the significant psychological and social impacts on the community, the Department of Human Services (DHS) secured additional funding from the Victorian Government of $673,500 for the financial year 2014/15.[92] DHS is working with the local community to determine the most efficient allocation of this funding.[93] Further details of the recovery effort are discussed in Chapter 4.7 Relief and recovery.

POTENTIAL LONG-TERM HEALTH EFFECTS

The Board is aware that there is a strong concern in the community about the potential long-term health impacts of exposure to smoke and ash from the Hazelwood mine fire.[94] Ms Maria Marino of Morwell told the Board: 'we were concerned about the long-term health issues arising due to exposure to toxic ash and smoke.'[95] Ms Tessie Jordan of Morwell told the Board: 'I am also worried about the long-term health effects. Who knows what might happen five years down the track?'[96]

The Department of Health and the EPA agreed that managing the health and environmental impacts of the Hazelwood mine fire was challenging, as there is a knowledge gap about the health effects of medium-term exposure to smoke and ash from a fire in a coal mine.[97] Dr Torre advised the Board that 'there are significant gaps in the scientific understanding of the effects exposure to fine particles such as $PM_{2.5}$ at the levels recorded in and around Morwell as a result of the mine fire on public health.'[98]

A primary concern is the period of time that residents were living with ashy, smoky conditions. Professor Campbell advised the Board that people with pre-existing cardiovascular and respiratory conditions are particularly susceptible to potential adverse long-term health effects when exposed to ozone, $PM_{2.5}$ and larger particles. In particular they are susceptible to an aggravation or progression of their underlying condition, an increased risk of lung cancer and potential effects on coagulation, which could result in an increased risk of arrhythmias, morbidity, hospital admissions and death.[99] He further advised that there was a risk that the general population could develop medium to long-term effects from the exposure

to $PM_{2.5}$ and ozone, including but not limited to the development of respiratory conditions, effects on cardiac conduction, increased risk of heart attack, stroke and lung cancer, long-term cognitive decline and psychosocial effects.[100]

The Department of Health has committed to undertake a long-term health study into the potential long-term health impacts of smoke and ash from the mine fire on affected communities. This is discussed further in Chapter 4.6 Health response.

DISCUSSION AND CONCLUSIONS

The Hazelwood mine fire undoubtedly caused significant distress to the local community. The smoke and ash produced by the fire resulted in a number of distressing adverse health effects. The majority of these health effects resolved when the fire was controlled, however a small portion of the community was still suffering during the Inquiry. Some people reported the development of new health conditions as a result of exposure to smoke and ash.

As detailed in Chapter 4.1 Health and wellbeing – background, the Latrobe Valley has an ageing population with a higher incidence of cardiovascular and respiratory disease. The area also has a high percentage of low-income households and a higher percentage of residents who have a disability. As a result, the Hazelwood mine fire added further insult to an already vulnerable community. To assist the community to recover from this incident and to improve health outcomes for the future, it would be beneficial for the Latrobe Valley to be the focus of renewed efforts to improve community health. This is discussed further in Chapter 4.6 Health response.

The Department of Health advised that there was not a significant increase in demand for health services during the fire, other than an increase in general practitioner presentations. The Board considers that the information collected and presented was not sufficiently complete for the Department of Health to make a full assessment of the physical, mental and social impacts of the short-term effects of the fire. Lack of a significant increase in health presentations to hospital is not an indication that the community was not suffering from distressing health conditions.

The Board agrees with Professor Campbell that the immediate health effects suffered by the community were likely due to smoke and ash produced by the Hazelwood mine fire. The symptoms suffered were generally consistent with what would be expected from exposure to the level of smoke produced by the mine fire.

The Board is concerned by the reports of children suffering from the effects of exposure to smoke. The evidence provided to the Board does not allow a conclusion about whether the symptoms suffered by the children were consistent with carbon monoxide exposure. However the Board accepts that there were adverse health effects due to smoke exposure.

The Board commends the Department of Health for commissioning the Rapid Health Risk Assessment of the potential health effects of the fire. However, the utility of the Rapid Health Risk Assessment would have been enhanced had it been available earlier to inform the Department of Health's decision-making. It also would have been beneficial to provide the Rapid Health Risk Assessment findings to the community to address its request for more information about the potential adverse health effects of the exposure to smoke and ash.

The Board recommends that the Department of Health continue to monitor the physical and psychological health of the community. The Board commends the Department of Health for including psychological effects in the proposed long-term study. The proposed long-term health study will be discussed further in the next Chapter.

The Board supports the State's proposal to undertake projects to understand health impacts and predict the movement of smoke from planned burns and bushfires.[101]

1. Exhibit 30 – Statement of Tracie Lund, para. 10
2. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
3. Written submission of Sandra Pattison; Community consultation, Kernot Hall Morwell, 10 April 2014, 12.30 pm
4. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm; Community consultation, Kernot Hall, Morwell, 10 April 2014, 6 pm; Community consultation, Moe Town Hall, 11 April 2014, 9.30 am; Community consultation, Federation University Churchill, 11 April 2014, 1.30 pm; Community consultation, Kernot Hall, Morwell, 15 April 2014, 7 pm; Community consultation, Morwell Bowling Club, 16 April 2014, 7 am; Community consultation, Latrobe Performing Arts Centre Traralgon, 16 April 2014, 11 am; Community consultation, Nindedana Quarenook, 7 May 2014, 1 pm; Community consultation, 20 Hazelwood Road, 7 May 2014, 4 pm; Community consultation, Morwell Club, 8 May 2014, 7 am
5. Exhibit 87 – Statement of Lisa Wilson, paras 14 & 30
6. Written submission of Julia Browell
7. Exhibit 35 – Statement of Simon Ellis, paras 41-45
8. Exhibit 35 – Statement of Simon Ellis, attachment SE-3
9. Written submission of Australian Nursing and Midwifery Foundation
10. Written submission of Australian Nursing and Midwifery Foundation
11. Written submission of Australian Nursing and Midwifery Foundation
12. Written submission of Olivia Brewer
13. Written submission of Julie Brown
14. Written submission of Daniel Caffrey
15. Written submission of Wendy Sands
16. Exhibit 48 – Expert report of Donald Campbell, para. 9
17. Exhibit 48 – Expert report of Donald Campbell, p. 24
18. Exhibit 48 – Expert report of Donald Campbell, para. 54
19. Exhibit 37 – California Guide for Public Health Officials
20. Exhibit 48 – Expert report of Donald Campbell, p. 24
21. Exhibit 42 – Statement of Ray Whittaker, para. 19
22. Written submission of Elaine Quirk
23. Exhibit 48 – Expert report of Donald Campbell, p. 23
24. Lester T1139:28 – T1140:2
25. Exhibit 46 – Statement of Rosemary Lester, para. 71(c)
26. Burke T1373:2 – T1374:16
27. Wilson T1942:30-31
28. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
29. Campbell T1138:25 – T1139:5
30. Exhibit 37 – California Guide for Public Health Officials
31. Exhibit 37 – California Guide for Public Health Officials, pp. 10 & 11
32. Lester T1138:21 – T1139:9
33. Lester T1140:12-17
34. Lester T1140:12-17
35. Written submission of the Victorian Council of Social Services
36. Lester T1139:10-14
37. Lester T1139:15-27
38. Exhibit 48 – Expert report of Donald Campbell, para. 54
39. Campbell T1227:9-30
40. Campbell T1127:9-30
41. Lester T1140:18-26
42. Exhibit 44 – Statement of Christopher Brook, para. 56
43. Exhibit 44 – Statement of Christopher Brook, paras 63-69
44. Brook T1084:20 – T1085:12
45. Exhibit 44 – Statement of Christopher Brook, attachment 4, pp. 4 & 5
46. Exhibit 44 – Statement of Christopher Brook, attachment 4, pp. 6 & 7
47. Exhibit 44 – Statement of Christopher Brook, attachment 4, pp. 7-9
48. Wilson T1940:9-19
49. Department of Health 2012, *Local Government Area Profiles, Latrobe City,* DOH, Melbourne, viewed 21 July 2014, http://docs.health.vic.gov.au/docs/doc/F0BD1A5CDF96FD94CA25786600150EE8/$FILE/Latrobe_2012-v02.pdf
50. Adapted from Exhibit 44 – Statement of Christopher Brook, attachment 4, p. 8
51. Exhibit 44 – Statement of Christopher Brook, attachment 4, pp. 15-18
52. Adapted from Exhibit 44 – Statement of Christopher Brook, attachment 4, p. 17
53. Exhibit 44 – Statement of Christopher Brook, para. 22
54. Lester T1206:4-15
55. Exhibit 48 – Expert report of Donald Campbell, para. 10

56. Exhibit 46 – Statement of Rosemary Lester, para. 32.4
57. Campbell T1233:27 – T1234:14
58. Lester T1136:19 – T1137:8
59. Exhibit 46 – Statement of Rosemary Lester, para. 39
60. Exhibit 39 – Expert report of Claire Richardson, para. 40
61. Exhibit 46 – Statement of Rosemary Lester, para. 39
62. Lester T1146:9-17
63. Exhibit 39 – Expert report of Claire Richardson, para. 40
64. Campbell T1243:1-22
65. Exhibit 46 – Statement of Rosemary Lester, para. 33
66. Exhibit 46 – Statement of Rosemary Lester, para. 36
67. Brook T1109:23 – T1110:2
68. Exhibit 48 – Expert report of Donald Campbell, p. 24
69. Campbell T1232:11-31
70. Exhibit 38 – Statement of Paul Torre, para. 9
71. Lester T1127:13-23
72. Exhibit 46 – Statement of Rosemary Lester, para. 58
73. Lester T1218:13-21
74. Exhibit 36 – Statement of Nicholas Pole, para. 87; Exhibit 98 – letter from VGSO dated 13 June 2014
75. Exhibit 36 – Statement of Nicholas Pole, attachment 45
76. Campbell T1228:26 – T1229:9
77. When people with asthma inhale irritants into their airways, they may experience symptoms similar to those for asthma, such as shortness of breath and a wheeze. This is known as reactive airways dysfunction syndrome (RADS). Symptoms usually appear within 24 hours of exposure.
78. The Board received a number of public submissions, however the individuals requested that the submissions be treated as confidential
79. Exhibit 48 – Expert report of Donald Campbell, pp. 23 & 25
80. Campbell T1231:12-27
81. Exhibit 46 – Statement of Rosemary Lester, attachment 15
82. Lester T1190:1-14
83. Lester T1189:21-24
84. Written submission of Malcolm McKelvie
85. Community consultation, 20 Hazelwood Road, Morwell, 7 May 2014, 4 pm
86. Community consultation, 20 Hazelwood Road, Morwell, 7 May 2014, 4 pm
87. Community consultation, 20 Hazelwood Road, Morwell, 7 May 2014, 4 pm
88. Written submission of Darren Geddes
89. Community consultation, Nindedana Quarenook, Morwell, 7 May 2014, 1 pm
90. Exhibit 48 – Expert report of Donald Campbell, p. 25
91. Written submission of the Victorian Council of Social Service, p. 21
92. Exhibit 56 – Statement of Alan Hall, para. 181
93. Hall T1508:5-19
94. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
95. Written submission of Maria Marino
96. Written submission of Tessie Jordan
97. Exhibit 38 – Statement of Paul Torre, para. 20
98. Exhibit 38 – Statement of Paul Torre, para. 23
99. Exhibit 48 – Expert report of Donald Campbell, p. 26
100. Exhibit 48 – Expert report of Donald Campbell, p. 26
101. Second written submission of the Victorian Government, 18 June 2014, para. 7.10

4.6 HEALTH RESPONSE

OVERVIEW

This Chapter considers the measures taken by various government departments and agencies to respond to the health emergency caused by the Hazelwood mine fire.

Under its Terms of Reference, the Board of Inquiry must examine and report on the adequacy and effectiveness of the response to the mine fire by government agencies, in particular measures taken in relation to the health and wellbeing of the affected community.

The health response to the Hazelwood mine fire was led by the Department of Health with the assistance of the Environment Protection Authority. The Department of Education and Early Childhood Development and the Latrobe City Council managed the health response for schools and children's services.

The Department of Health provided advice to the Incident Controller in relation to the public health consequences of the Hazelwood mine fire, monitored demand for health services, ensured coordination of health resources, and was responsible for the strategic oversight of the health response. The Chief Health Officer, Dr Rosemary Lester, was the Government's spokesperson about health issues during the mine fire. The Department of Health also engaged with local general practitioners and health services.

This Chapter includes an overview of the regulatory framework relevant to air quality, and reviews the response to elevated levels of carbon monoxide and $PM_{2.5}$ in the Latrobe Valley during the mine fire.

Prior to the Hazelwood mine fire, the Environment Protection Authority and the Department of Health developed a Bushfire Smoke Protocol to assist with decision-making in the event of high levels of smoke from a bushfire. During the mine fire, further joint protocols were developed to help inform decision-making and advice to the community about increased levels of carbon monoxide and $PM_{2.5}$ in the air.

In this Chapter, the Board considers the decision to issue a 'Watch and Act' alert on 15 February 2014 in response to elevated levels of carbon monoxide in the air. The Board also reviewed the Chief Health Officer's advice on 28 February 2014 that 'at risk' groups south of Commercial Road temporarily relocate from Morwell due to high levels of $PM_{2.5}$ in the air.

A number of additional measures were put in place to provide health information and support to the community during the Hazelwood mine fire. These include the establishment of a community respite centre and a health assessment centre.

The Department of Health has committed to undertake a 10 year health study into the potential long-term adverse health effects to the community as a result of exposure to smoke and ash from the Hazelwood mine fire.

The local community provided the Board of Inquiry with extensive feedback about the Government's health response. The Board heard from individuals from the Department of Health, the Department of Human Services, the Environment Protection Authority, the Department of Education and Early Childhood Development and the Latrobe City Council. These agencies described measures undertaken in response to the health emergency and why certain measures were adopted. To assist the Inquiry, the Board engaged an independent expert Professor Donald Campbell, Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health.

The Board commends the Department of Health for the development of a health assessment centre and the community respite centre. The Board commends the Latrobe City Council for independently taking action to minimise the impact of the mine fire on children and school staff. The Board also commends the Environment Protection Authority and the Department of Health for their commitment to developing the carbon monoxide and $PM_{2.5}$ protocols, and for obtaining peer reviews of the protocols.

The Board is concerned with several aspects of the protocols. The Bushfire Smoke Protocol generated a number of repetitive smoke advisories, but it did not provide actionable advice for the community to respond to varying levels of smoke. The community Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol were developed during the mine fire and because of this could not be used to protect the community in the early stages of the fire. The advice of international experts is that the acute exposure standards, used as a basis for the community carbon monoxide protocol, are too high and should be reviewed. The Board is concerned about the inconsistency between the community carbon monoxide protocol and the firefighter carbon monoxide protocol.

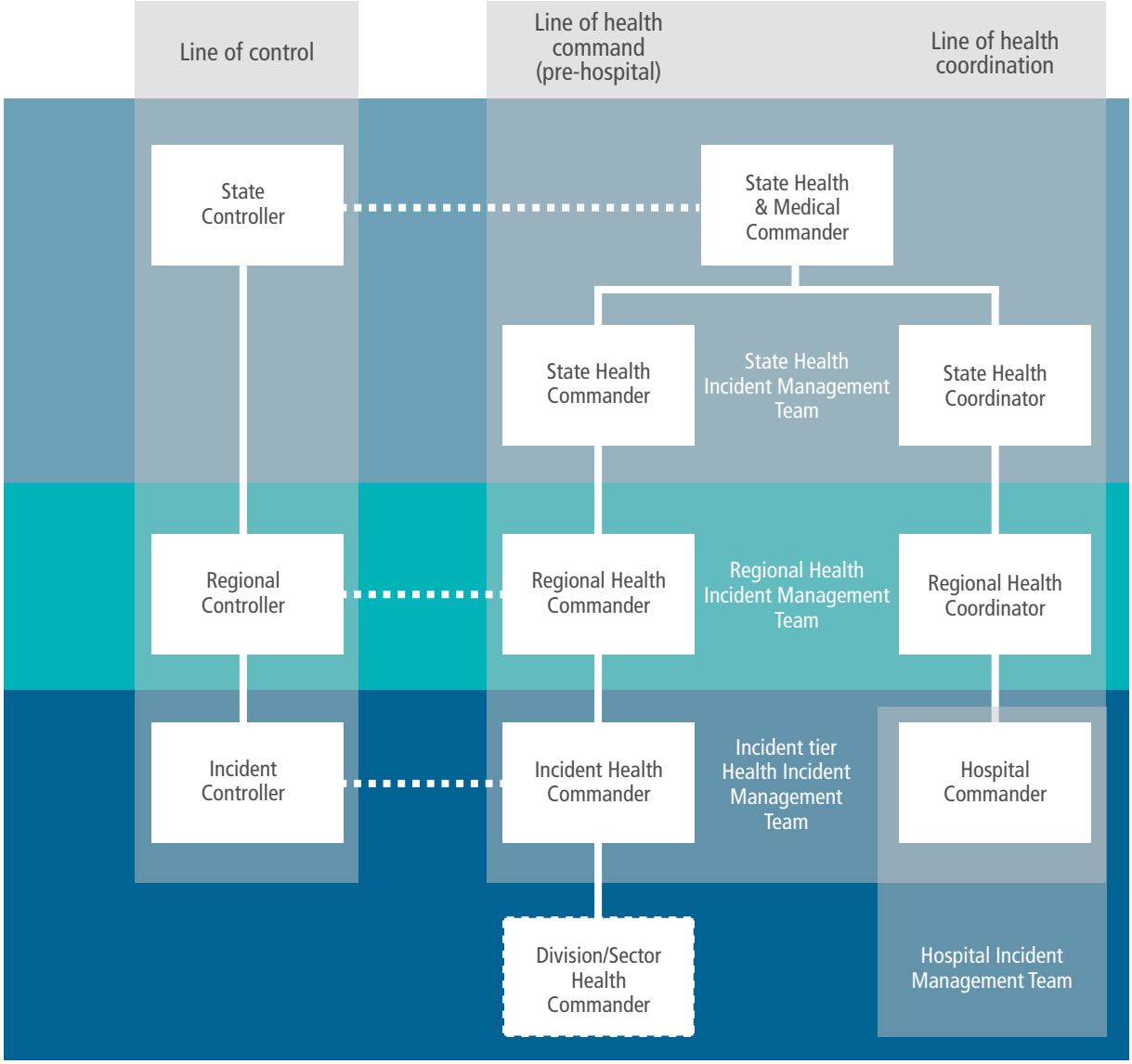
The Board concludes that the response to poor air quality in the Latrobe Valley as a result of the Hazelwood mine fire was delayed and overly reliant on validated air quality data when indicative air quality data was sufficient to inform health advice. The Board considers that the temporary relocation advice to vulnerable groups should have been provided earlier.

DEPARTMENT OF HEALTH

The Department of Health is the government department responsible for health planning, policy development, funding and regulation of health service providers, and activities that promote and protect Victoria's health.[1] In an emergency, the Department of Health's role is defined in the Emergency Management Manual Victoria. The Department of Health's level of response to an emergency depends on the impact of the emergency on the health system and whether control of the emergency is exercised at an incident, local or state level. At each level of response, an Emergency Management Team is responsible for developing an incident strategy that addresses the risks and consequences of the incident.[2]

The State Health Emergency Response Plan provides a framework for planning a coordinated health approach during emergencies, regardless of whether the emergency has local, state or national implications. Under this Plan, the Department of Health is responsible for monitoring the demand on health resources that arise from an emergency incident, and coordinates and directs the deployment of health resources as required. This is undertaken through the State Health and Medical Commander, the State Health Commander and the State Health Coordinator.[3] Figure 4.45 summarises the reporting lines for health command and health coordination during an emergency.

Figure 4.45 Reporting lines under the State Health Emergency Response Plan during an emergency[4]



CHIEF HEALTH OFFICER

The responsibilities and powers of the Chief Health Officer are outlined in s. 20 of the *Public Health and Wellbeing Act 2008* (Vic) (Public Health and Wellbeing Act). The Chief Health Officer is responsible for developing and implementing strategies around public health, and providing advice to the Government about public health issues. The Chief Health Officer has the power to order that people are examined, tested or quarantined if they pose a risk to public health. The Health Protection Branch of the Department of Health supports the Chief Health Officer.[5]

Part 2 of the Public Health and Wellbeing Act outlines the key principles that must be applied in decisions made pursuant to the Act. The key relevant principles include:

- Evidence based decision-making–decisions about the most effective use of resources to promote and protect public health and interventions should be based on evidence available that is relevant and reliable.[6]
- Precautionary principle–if a public health risk poses a serious threat, lack of full scientific certainty should not be used as a reason for postponing measures to prevent or control the public health risk.[7]
- Proportionality–decisions made must be proportionate to the public health risk.[8]

Accordingly, the Chief Health Officer is required to balance a number of different principles and roles in an emergency. However, the Chief Health Officer is not the final decision–maker in an emergency–this responsibility and authority remains with the Incident Controller.[9]

The Chief Health Officer is also the Government's spokesperson in relation to health issues during an emergency, such as the Hazelwood mine fire.[10]

DEPARTMENT OF HEALTH RESPONSE TO THE HAZELWOOD MINE FIRE

The Department of Health was one of a number of agencies supporting the Country Fire Authority (CFA) during the Hazelwood mine fire.[11] The Department of Health provided the CFA with resources and personnel as required, provided advice to the Incident Controller in relation to the public health consequences of the fire, ensured coordination of health resources, and was responsible for the strategic oversight of health coordination.[12] The Department of Health was also responsible for monitoring the demand for health services during the mine fire, coordinating and directing the deployment of health system resources, providing support to responding agencies, and providing information to the public about health issues arising from the fire.[13]

Dr Christopher Brook, State Health and Medical Commander, was responsible for directing medical and health resources during the Hazelwood mine fire. Dr Rosemary Lester, Chief Health Officer, provided advice and support to the responsible control agencies in relation to the public health consequences of the fire. Dr Brook and Dr Lester were also members of the State Emergency Management Team, which liaised with the State Incident Controller.[14]

PROVISION OF HEALTH INFORMATION

The community looked to Dr Lester to provide information and advice about the public health risks associated with exposure to smoke and ash from the fire. Information provided by Dr Lester and the Department of Health was communicated in a variety of ways, including through the Department of Health's website, media interviews and community information sheets.[15]

This section focuses on the content and adequacy of the public health message. Details about the method and timing of communications by Dr Lester and the Department of Health are discussed further in Part Five Communications.

PUBLIC HEALTH MESSAGES

The public health messages provided by the Department of Health, and in particular Dr Lester, evolved over the duration of the fire. The health advice provided to the community over time can be described as follows:

- 13 February 2014–the message was conveyed that everyone, particularly those in 'at risk' groups (people over 65, preschool aged children and those with pre-existing heart or lung conditions) should avoid prolonged or heavy physical activity outdoors.
- 14 February 2014–the message was conveyed that during extended periods of very smoky conditions, people in 'at risk' groups should consider temporarily staying with a friend or relative living outside the smoke-affected area.
- 17 February 2014–pregnant women were added to the 'at risk' category.
- 25 February 2014–those in 'at risk' groups were advised to consider temporarily staying outside the smoke-affected area, and the community at large was advised to consider a break away from the smoke, and to avoid outdoor physical activity.
- 28 February 2014–those in 'at-risk' groups living or working in the southern part of Morwell were advised to temporarily relocate.[16]

Dr Lester told the Board that in addition to the above messages, she repeatedly communicated to the community that 'smoke is bad for your health, smoke has health effects, and avoid the smoke as much as possible; stay out of the smoke, ideally take breaks away from the smoke.'[17]

Members of the community told the Board that they were concerned with the advice provided by the Chief Health Officer because it did not match their experiences. Ms Annette Wheatland, Gippsland Regional Manager at Southern Cross Care Victoria, who works in Morwell, stated: '…I found it really difficult to make a decision to know what to do because the advice was pretty much that everything's okay, but I knew it wasn't.'[18]

Some members of the community expressed frustration with what they perceived to be inconsistent advice provided by Dr Lester over the course of the mine fire. As described by local resident Ms Brenda Maguire in her submission to the Board: 'advice given to the public by Dr Rosemary Lester slowly and subtly changed over the period of the fire, tending towards admitting the smoke was a health risk – yet the town was never evacuated.'[19]

COMMUNITY INFORMATION SHEETS

During the Hazelwood mine fire, Dr Lester published a number of alerts, advisories and community information sheets about the potential adverse health impacts of smoke and ash. This information was in addition to the bushfire smoke advisories issued by the Environment Protection Authority (EPA), which included basic health advice from Dr Lester.

Dr Lester told the Board that the health alerts were primarily directed at health practitioners, whereas the community information sheets were primarily directed at the community.[20]

Community information sheets were developed by the Department of Health in response to community questions and concerns about smoke from the Hazelwood mine fire.[21] The community information sheets were available from the Department of Health website, as well as in hard copy from respite and health centres established during the fire, and from the community engagement bus.

Community information sheets were published on or around 24 February 2014. Figure 4.46 provides a summary of the key messages detailed in these information sheets.[22] Figure 4.47 summarises key messages in community information sheets distributed on 12 March 2014.

Figure 4.46 Key messages from community information sheets distributed by the Department of Health on 24 February 2014

Community information sheet	Key messages
Smoke and your health	• How smoke affects your health depends on your age, pre-existing medical conditions such as asthma or heart disease, and the length of time you are exposed to the smoke. • Signs of smoke irritation include itchy eyes, sore throat, runny nose and coughing. • Children, the elderly, pregnant women, smokers and people with pre-existing illnesses such as heart or lung conditions (including asthma) are more sensitive to the effects of breathing in fine particles. • During extended smoky conditions, sensitive individuals should consider temporarily staying with a friend or relative living outside the smoke-affected area. Others should consider a break away from the smoky conditions. • Avoid physical activity outdoors. • People with a heart or lung condition should follow their treatment plan advised by their doctor. • When at home, stay indoors with all windows and doors closed.
Rainwater tanks	• If you live in a smoke-affected area you should be aware that your water tank could become contaminated from ash. • If your water tastes, looks or smells unusual do not drink it. • Water testing is not necessary as contamination is usually obvious. • The most effective way to prevent contamination of your water tank is to ensure that your tank is properly sealed and that you disconnect the down pipes while your house is affected by smoke and ash.
Face masks questions and answers	• It is better to stay indoors, however if you have to go outdoors and choose to wear a face mask it's important to understand their benefits and limitations. • There are many different types of face masks. • Ordinary paper dust masks, handkerchiefs or bandannas do not filter out fine particles or gases contained in the smoke such as carbon monoxide. • Fitted properly a P2 face mask can filter out some of the fine particles of the smoke. • P2 masks will not provide complete protection. They do not remove or protect against gases contained in the smoke such as carbon monoxide. • P2 masks can be very hot and uncomfortable and can make it harder to breathe normally. • Anyone with pre-existing heart or lung condition should seek medical advice before using a face mask.
Cleaning up a smoke and ash affected home	• The ash deposited by the Latrobe Valley coal mine fires is relatively non-toxic and is similar to the ash that might be found in your fire place. • Ash particles have the potential to act as mild skin, eyes, nose or throat irritants but are too large to be breathed deeply into the lungs. • Ash on household surfaces is unlikely to cause short or long term health effects. • To reduce ingestion of ash or nuisance to the skin, eyes, nose or throat, wear gloves, long sleeved shirts to avoid skin irritation, well fitted dust masks, practice good hygiene. • It is not recommended that babies or young children play in ash or dusty conditions.

Additional community information sheets were published on 12 March 2014.[23]

Figure 4.47 Key messages from community information sheets distributed by the Department of Health on 12 March 2014

Community information sheets	Key messages
Carbon monoxide	• Carbon monoxide is a colourless, odourless gas. It is found in smoke and is formed from the incomplete combustion of coal. • Carbon monoxide levels in the Morwell Township and around the perimeter of the mine are being monitored. • To date, the levels of carbon monoxide in the air are not a health concern for the general community. • When breathed in, carbon monoxide displaces oxygen in the blood and deprives the heart, brain and other vital organs of oxygen. • Carbon monoxide may cause "flu-like" symptoms such as headache and tiredness, progressing to dizziness, confusion, nausea or fainting. Very high amounts of carbon monoxide in the body may result in oxygen deprivation, leading to loss of consciousness and death. • The effects of carbon monoxide exposure are reversible in most cases.
Ash fall out	• The primary health concern for ash fallout is settling on surfaces, skin contact or nuisance to the eyes. • Ash particles can irritate the eyes, nose and throat but are too large to be breathed deeply into the lungs. • If you experienced irritation to your eyes, nose or throat, these effects should resolve quickly once the fires are controlled and the ash fall out has ceased. • To reduce ingestion of ash or nuisance to the eyes: practice good hygiene. • It is not recommended that babies and young children play in ash or dusty conditions. • For fine particles in smoke, sensitive individuals should consider temporarily staying with a friend or relative living outside the smoke affected area. Others should also consider a break away from the smoky conditions.

Despite the above community information sheets, many community members told the Board that they felt uninformed about the potential adverse health risks of the mine fire. At community consultations, the Board was told that there was a lack of information about what was in the smoke and ash that had settled in water tanks, wall and roof cavities.[24] Community concern was also expressed in relation to inconsistent advice received about the most appropriate way to clean ash. Members of the community told the Board, that the level of information provided about air and water quality and how individuals should manage pollution levels, was inadequate.[25]

BUSHFIRE SMOKE PROTOCOL

During the Hazelwood mine fire, the Department of Health, in conjunction with the EPA, issued a number of bushfire smoke advisories pursuant to the Bushfire Smoke, Air Quality and Health Protocol (Bushfire Smoke Protocol).

The Bushfire Smoke Protocol was first developed during the 2006/2007 summer fire season.[26] Dr Lester and Mr Chris Webb, Director of Environment Regulation at the EPA, formally endorsed the Bushfire Smoke Protocol on 13 February 2014 (notwithstanding that the protocol was already operating prior to this date).[27] Dr Lester told the Board that the Bushfire Smoke Protocol was developed by the Department of Health with the EPA to define agreed actions and health messages prior to a fire season so that the agencies did not have to develop decision-making processes while an incident was occurring.[28]

The Bushfire Smoke Protocol provides triggers for the EPA to issue a low level or high level smoke advisory (via a media release) based on defined air quality indicators, including PM_{10} and visibility. The protocol does not refer to $PM_{2.5}$. A 'low level advisory' is issued when the smoke level is unhealthy for sensitive groups and a 'high level advisory' is issued when the level of smoke is unhealthy for the whole community.[29] Media releases that outlined air quality were issued over the course of the mine fire. They included pre-determined quotes from Dr Lester with general advice about actions to reduce health impacts caused by smoke.[30]

A high level smoke advisory has three different air quality categories (see Figures 4.48 and 4.49). Dr Lester told the Board that the air quality categories were for internal use only and that there was no need for three different smoke alerts for each category, as the actions that the community needs to take to protect themselves from the smoke are the same.[31] For example, the advice contained in the high level smoke advisory was the same no matter whether the level 'high' referred to 'unhealthy for all', 'very unhealthy' or 'hazardous'.

Figure 4.48 Bushfire advisory categories based on PM_{10} monitoring and visibility[32]

Bushfire smoke advisory level	Air Quality (AQ) Categories	PM_{10} (24 hour) µg/m³	PM_{10} (1 hour) µg/m³	Visibility (determined by observers)
Not applicable	Good	Less than 50	Less than 80	> 20km
LOW	Unhealthy sensitive	51 to 65	81 to 175	< 20km & > 10km
HIGH	Unhealthy – all	66 to 155	176 to 300	< 10km & > 5km
HIGH	Very unhealthy – all	156 to 310	301 to 500	< 5km & > 1km
HIGH	Hazardous	>310	>500	< 1km

Figure 4.49 Bushfire cautionary advice and actions[33]

Bushfire smoke advisory level	Air Quality (AQ) Categories	Visibility	Landmark visible from home	Potential health effects	Cautionary health advice
No media release	Good	> 20km	20km or more	Meets the relevant air quality standard	None
LOW	Unhealthy – sensitive	< 20km & > 10km	10km	People with lung or heart conditions, elderly, children	People with heart or lung conditions, children and older adults should **reduce** prolonged or heavy physical activity No specific message for everyone else other than sensitive groups
HIGH	Unhealthy – all	< 10km & > 5km	5km	Increased likelihood of effects for people with lung or heart conditions, elderly or children General population respiratory symptoms	People with heart or lung conditions, children and older adults should **avoid** prolonged or heavy physical activity Everyone else should **reduce** prolonged or heavy physical activity
HIGH	Very unhealthy	< 5km & > 1km	1km	Increased likelihood of effects for people with lung or heart conditions, elderly or children General population respiratory symptoms	People with heart or lung conditions, children and older adults should **avoid all** physical activity **outdoors** Everyone else should **avoid** prolonged or heavy physical activity
HIGH	Hazardous	< 1km	Less than 1km	Increased likelihood of effects for people with lung or heart conditions, elderly or children General population respiratory symptoms	People with heart or lung conditions, children and older adults should **remain indoors and keep activity levels as low as possible** Everyone should **avoid all** physical activity **outdoors**

Mr John Merritt, the former Chief Executive Officer of the EPA, advised the Board that:

> ...[t]here was heavy reliance and close collaboration between EPA and the Department of Health on the existing Bushfire Protocol [and that] this formed the basis for the regular smoke advisories provided to the public.[34]

During the Hazelwood mine fire, the EPA issued 58 advisories pursuant to the Bushfire Smoke Protocol.[35] These consisted of 32 'low level' smoke advisories and 26 'high level' smoke advisories.

NURSE-ON-CALL

Nurse-On-Call is the Department of Health's telephone health advice line. It is a free, 24-hour telephone advice line, funded by the Department of Health and staffed by nurses.[36] Nurse-On-Call was actively promoted to the community during the Hazelwood mine fire as a source of health information.[37]

Dr Lester told the Board that Nurse-On-Call, rather than a generic hotline, was promoted to the community as it enables an individual to convey information and seek advice about a specific health problem. She informed the Board that Nurse-On-Call provides 'constant health advice for people who ring and it's authoritative, its content is known and trusted'.[38] Nurse-On-Call staff were provided with all of the Department of Health's information to ensure consistent information was provided to callers.[39]

The Victorian Government submitted to the Board that general health queries were answered quickly via social media and more serious medical concerns were addressed by health professionals through various channels including Nurse-On-Call.[40]

Ms Lisa Wilson, Gippsland Homeless Network Coordinator at Quantum, utilised the Nurse-On-Call service. She told the Board that she was disappointed the Nurse-On-Call service did not have information about what might be happening due to the smoke. She also described feeling let down by the approach the service took to her call: 'we were being questioned about who we were and what we were doing, more so than us trying to get information from them.'[41]

ENGAGEMENT WITH LOCAL GENERAL PRACTITIONERS AND HEALTH SERVICES

During the Hazelwood mine fire, Dr Brook and Dr Lester were informed about the impact of the mine fire on the community and on local health services by a range of health sector sources. This included regular information from the Latrobe Regional Hospital, local general practitioners and Ambulance Victoria. The information received by Dr Brook and Dr Lester during the fire indicated that the demand for health services could be managed within the local health system's existing capacity.[42]

Dr Brook reported to the Board that in keeping with usual practice, the Department of Health provided information to health service providers to assist them with issues and concerns that patients may have during the Hazelwood mine fire.[43]

Independent expert Professor Donald Campbell, Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health, highlighted for the Board the importance of engagement with local general practitioners during a health emergency. He explained that people look to doctors to advocate on their behalf and expected them to understand health issues and to provide consistent advice.[44]

On 13 February 2014, Dr Lester issued a health alert directed to local government authorities, the health and aged sectors, government departments and agencies, service providers and community groups. In addition to providing general advice about the level of smoke from the Hazelwood mine fire, the health alert stated that general practitioners in the Latrobe Valley were likely to see an increase in presentations and calls from 'at risk' patients concerned about the health impacts of smoke. The health alert also stated that anyone with a cardiovascular or respiratory condition should follow the treatment plan advised by their doctor and anyone with symptoms such as wheezing, chest tightness and difficulty breathing should seek medical advice promptly. That alert was updated on 17 February 2014 and 21 February 2014, but did not provide any additional information to assist general practitioners.[45]

On 19 February 2014, the Department of Health contacted 18 local general practitioners to discuss any increase in demand they had seen during the Hazelwood mine fire. From this date, the Department of Health received twice-weekly reports, via Medicare Local, about the impacts on general practices in the Latrobe Valley from the Hazelwood mine fire.[46]

On 4 March 2014, Dr Lester issued an advisory that provided updated advice about the Hazelwood mine fire to local government authorities, the health and aged sectors, government departments and agencies, and service providers and community groups. The advisory included a paragraph titled 'clinical advice', which stated that 'clinical advice or onward referral for further assessment or management should be through usual pathways' and that toxicological advice could be obtained from the poisons information line or Austin Health.[47]

Despite these measures, some local general practitioners felt that they were not kept sufficiently informed during the Hazelwood mine fire, and as a result they were not able to appropriately advocate for their patients. Some general practitioners told the Board that in the absence of authoritative information, they do not become aware of trending issues until they see multiple patients presenting with similar symptoms.[48] They told the Board that the Department of Health should have informed all local medical practitioners of the following, within three days of the mine fire starting:

- current circumstances
- what local practitioners could anticipate
- what local practitioners should do
- how the situation would be monitored
- that people with respiratory/cardiac issues should leave the area.[49]

Professor Campbell told the Board that general practitioners should get the right source of information about a specialised and unusual event to inform the provision of advice that they give their patients. He submitted that general practitioners need simple, actionable messages that can be applied to patients. He explained that as a health practitioner and receiver of health messages:

> anything more sophisticated than traffic lights, colour-coded, three levels, is going to get lost… if you make it more sophisticated than that for me, I will struggle to absorb the information and turn it into an actionable message.[50]

RESPONSE TO ELEVATED LEVELS OF CARBON MONOXIDE IN THE COMMUNITY

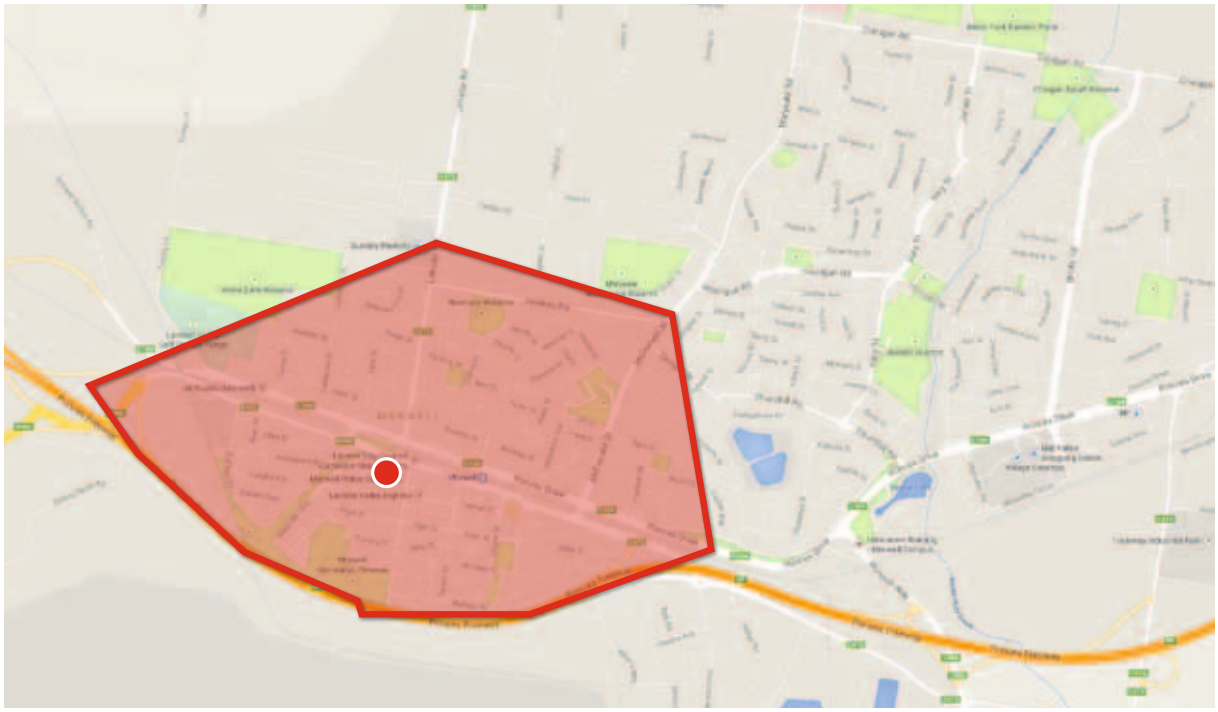
CARBON MONOXIDE LEVELS ON 15 AND 16 FEBRUARY 2014

Dr Lester reported to the Board that from 12 February 2014 there was concern, including among the community, about the levels of carbon monoxide being produced by the Hazelwood mine fire.[51]

On 13 February 2014, the EPA and CFA conducted monitoring of the carbon monoxide levels in the community.[52] Dr Paul Torre, Science officer at the EPA, advised that no elevated or significant readings of carbon monoxide were obtained from testing undertaken in the community on 13 or 14 February 2014.[53]

Mr Costa Katsikis, MFB HazMat technician and Deputy Incident Controller, reported to the Board that on 15 February 2014, CFA HazMat technicians recorded elevated readings of carbon monoxide in the Morwell community. The carbon monoxide spot readings were elevated in and around Morwell, with a peak reading recorded near the Morwell Police Station, which is located south of Commercial Road.[54] Mr Katsikis stated that a meeting was promptly held with the Incident Controller, Scientific Advisor, and the Public Information Officer, who agreed that a 'shelter in place' warning should be issued to local residents in the affected area. Consequently, a 'Watch and Act' alert was issued by the CFA via text message, to a defined group of residents located close to the mine, at approximately 1 pm (see Figure 4.50).[55] The message stated: 'Watch and Act: Morwell residents indoors immediately, close windows/doors/vents. Seek further info via radio.'[56]

Figure 4.50 Distribution of 'Watch and Act' alert on 15 February 2014[57]



Mr Craig Lapsley, Fire Services Commissioner, informed the Board that the national emergency alert telephone alerting system (developed after the 2009 bushfires) was used to send the 'Watch and Act' alert to more than 26,000 fixed and mobile telephone subscribers within or passing through the area.[58]

Dr Lester told the Board that she was advised by the health staff at the Regional Incident Control Centre of the intended notification and sought to provide a risk assessment to the Incident Controller.[59] In response to the request for a copy of the risk assessment, the Board was provided with an email to Dr Lester from Mr Julian Meagher, Manager Public Health Emergency Management, Office of the Chief Health Officer. The email was sent at 3 pm on 15 February 2014 (after the 'Watch and Act' alert was issued). The email stated that:

> ...the Incident Controller used a determination that is for exposures in HazMat incidents of 9 ppm however this trigger is an occupational one and is on the basis of 9 ppm over an 8 hr period… the level of 15 ppm is one that a normal person would be exposed to from heavy traffic… or indeed from cooking dinner over a gas stove.[60]

The Board was not advised whether this information was also provided to the Incident Controller and if so, if the information was provided before or after the 'Watch and Act' alert was issued.

The Department of Health was not involved in the decision to issue the 'Watch and Act' alert.[61] Dr Lester told the Board that she did not agree with the 'Watch and Act' alert being distributed and considered that it was unhelpful as it sent a very concerning message to the community that was not necessary.[62]

Later that afternoon there was an easterly wind change, which dispersed the carbon monoxide.[63] The 'Watch and Act' alert was downgraded at around 6.45 pm and residents were sent a further text message that stated: 'Watch and Act – can go outside and open doors and windows.'[64]

Mr Katsikis informed the Board that the CFA continued to measure increased levels of carbon monoxide on 16 February 2014. The readings on this day averaged 20-30 ppm, with a peak of 60 ppm. Readings were taken inside and outside the Morwell Bowling Club (South) and were consistent for a number of hours.[65]

The Traralgon Incident Management Team was aware of the consistently high carbon monoxide readings and considered actions ranging from evacuation to a community warning. A 'shelter in place' warning was discussed, however the feasibility of this was dismissed as the readings from the Morwell Bowling Club (South), both internally and externally, indicated that sheltering in place would still pose an exposure risk.[66]

Mr Katsikis stated to the Board that later that day he was informed that an agreement had been reached in relation to community warnings, and that the EPA would provide the information to the Department of Health, which would ultimately decide on the appropriate community warning to be issued.[67] Dr Lester told the Board that she was not involved in this decision. However, it was her understanding that the Incident Controller cannot divest himself or herself of responsibility for communications.[68]

On 16 February 2014, the EPA, with the CFA, continued to monitor the levels of carbon monoxide in the community.[69] The readings were reported to the Department of Health via an email from Dr Torre to Ms Vikki Lynch, Advisor, Health Risk Management, Department of Health, at 8.41 pm. The email stated that from 12.30 am to 8.30 am that morning, carbon monoxide levels ranged from 25 ppm to 45 ppm. The email also included a number of short-term readings at various locations in Morwell taken from 1.30 pm to 6.30 pm. These readings ranged from seven ppm to 57 ppm. The Department of Health determined that no further action was required that evening. The email makes reference to a discussion between Ms Lynch and Dr Torre that occurred prior to the email, however no evidence has been provided to the Board about this discussion.[70]

Dr Lester told the Board that whilst she considered that the readings were high, which was concerning, she understood that the readings were spot readings and so were not sufficiently reliable to inform public health advice or to trigger the Carbon Monoxide Response Protocol (discussed below). She advised the Board that to her knowledge, Ms Lynch did not utilise the data to calculate an indicative average of the readings.[71]

No warning or advice was issued to the community in relation to high carbon monoxide levels in the southern part of Morwell during the afternoon and evening of 16 February 2014.

Dr Torre told the Board that the levels of carbon monoxide recorded in the community even surprised the EPA:

> … those carbon monoxide levels, were very unusual. I've never seen carbon monoxide levels at that concentration – not that I've seen a lot of coal mine fires, but I was really surprised at the elevated levels. Even when we tried to do a correlation between the particle levels and carbon monoxide, we couldn't find a pattern. It was really such a different fire. Carbon monoxide levels I've never seen before.[72]

CARBON MONOXIDE RESPONSE PROTOCOL

Dr Lester told the Board that given the high levels of carbon monoxide recorded in the community, on 15 February 2014, the Department of Health developed the Carbon Monoxide Response Protocol to provide a decision-making tool to assess the risks to the community of the elevated levels, and if necessary provide advice to the Incident Controller.[73] The Department of Health's Principal Health Risk Advisor and Air Quality Specialist drafted the protocol, together with a number of other relevant medical and environmental health professionals within the Department.[74]

The National Environment Protection Measure (NEPM) for Ambient Air Quality provides that the ambient air quality standard for carbon monoxide for an average period of eight hours is 9 ppm, and that this should only be exceeded on one occasion per year.[75] Dr Lester told the Board that the NEPM was not an appropriate standard for the Carbon Monoxide Response Protocol, as it was intended for longer periods, not for an acute event.[76] Dr Lester explained that the 'Protective Action Decision Guide for Emergency Services during Outdoor Hazardous Atmospheres', signed off by all relevant Victorian agencies in 2011, was used as the basis for the selection of the thresholds for the Carbon Monoxide Response Protocol.[77] The Guide recommended that the Acute Exposure Guideline Levels (AEGL) be used for short-term community exposures to outdoor air chemical concentrations for a range of hazards. The Carbon Monoxide Response Protocol was based on AEGL-2 levels, which relate to the 'airborne concentration above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious long-lasting effects.' The AEGL-2 aims to maintain a person's carboxyhaemoglobin level at less than four per cent.[78]

Figure 4.51 Health protection air levels according to AEGL-2

Health protection air level for carbon monoxide (ppm)	Average period for monitoring against the health protection level for carbon monoxide
AEGL–2 levels for carbon monoxide: • 420 ppm • 150 ppm • 83 ppm • 33 ppm • 27 ppm	Averaged over: • 10 minutes • 30 minutes • 1 hour • 4 hours • 8 hours

The Department of Health used the levels indicated in Figure 4.51 above to develop the Carbon Monoxide Response Protocol. The Department of Health then applied a further level of conservatism by lowering the standard for one hour exposure from 83 ppm to 70 ppm.[79]

The Carbon Monoxide Response Protocol provides that if the one hour average value of 70 ppm carbon monoxide is reached, or if the four hour average value of 33 ppm carbon monoxide may be reached, or if the eight hour average of 27 ppm carbon monoxide may be reached, then:

- The Department of Health and the Regional Deputy Commander must be immediately advised.
- The Department of Health will convene an internal assessment team to assess the data against the AEGL-2 advice matrix (see Figure 4.52) continuously until the situation is resolved. The advice matrix recommends a number of different messages to the community depending on the level and duration of the exposure to the plume, including recommendations to 'watch and act', to 'shelter in place' and to relocate.
- The EPA will verify the results by continuous monitoring of carbon monoxide levels averaged over 15 minute periods and short-term spot monitoring (including deriving the area of smoke plume and wind direction).
- If the results confirm that the levels exceed the one hour average or meet the four or eight hour average trigger level carbon monoxide reading, the Department of Health will advise the Regional Incident Controller who will convene a Regional Emergency Management Team to deploy specialists to identify the safest area for potential redeployment of the community.[80]

The Carbon Monoxide Response Protocol also includes an advice matrix to assist the Department of Health's assessment team when considering advice to the Incident Controller (see Figure 4.52). The carbon monoxide readings in the table below are hourly averages, not spot readings. It is unclear why the Carbon Monoxide Protocol advice matrix includes the level for 83 ppm (consistent with the AEGL-2 guidelines) and not 70 ppm for the one hour exposure standard.

Figure 4.52 Carbon Monoxide Response Protocol advice matrix[81]

CO Readings Matrix

	Predicted Duration of Plume (How long the plume is in the area)							
CO Readings ppm	**>12**	**10–12**	**8–10**	**6–8**	**4–5**	**2–4**	**1–2**	**<1**
150	EWEVAC	EWEVAC	EWEVAC	EWEVAC	EWEVAC	EWSIP	EWSIP	EWSIP
83	EWEVAC	EWEVAC	EWEVAC	EWEVAC	EWSIP	EWSIP	EWSIP	EWSIP
33	EWEVAC	EWEVAC	WSIP	WSIP	WSIP	A	A	A
27	WSIP	WSIP	WSIP	A	A	A	A	A

EWSIP – (Emergency Warning Shelter in Place)
EWEVAC – (Emergency Warning Evacuate)
Upgrade/Update
WSIP – (Watch & Act Shelter in Place)
Upgrade/Update
Downgrade
A – (Advice)
Downgrade
All Clear
Campaign

Assumptions

- Shelter in place provides 6 hour protection before the equalisation with the external atmosphere
- CO based on average reading over a 30 to 60 minute period
- BoM to provide meteorological forecast of wind speed, direction and duration
- BoM prediction to inform the estimated time of exposure

The Carbon Monoxide Response Protocol applied significantly higher carbon monoxide exposure standards for the community than those applicable under the Health Management and Decontamination Plan, which applied to firefighters (discussed in Chapter 4.4 Firefighter health). The Victorian Government submitted that the justification for this difference was that firefighters are in an environment that is much more exposed to the hazard and that carbon monoxide levels would be expected to dissipate more rapidly in the open air outside the mine.[82]

Dr Lester informed the Board that from 19 February 2014, when the Department of Health started receiving validated carbon monoxide data from the EPA, the levels of carbon monoxide did not indicate any potential risks to public health.[83] There was no evidence before the Board that the Carbon Monoxide Response Protocol was triggered during the Hazelwood mine fire.

PEER REVIEWS OF THE CARBON MONOXIDE RESPONSE PROTOCOL

The Department of Health and the EPA each had the Carbon Monoxide Response Protocol independently peer reviewed in late February 2014. The peer reviews raised a number of concerns about the Protocol.

The Department of Health had the Carbon Monoxide Response Protocol reviewed by Ms Lyn Denison, Principal Scientist at Toxikos. Ms Denison concluded that the Protocol was appropriate, however commented that if fires lead to prolonged periods (days to weeks) of consistently elevated exposure to carbon monoxide, the AEGLs are not appropriate and the triggers would need to be revised to reflect 'sub-chronic' rather than acute exposure.[84]

The EPA had the Carbon Monoxide Response Protocol reviewed by epidemiologists Dr Fay Johnston, Senior Research Fellow, Environmental Epidemiology, Menzies Research Institute, Tasmania, University of Tasmania, and Professor Ross Anderson, Professor of Epidemiology and Public Health, St Georges University of London and Kings College London. Dr Johnston and Professor Anderson both raised concerns about the use of the AEGL-2 guidelines as the response framework for the Protocol.[85] The AEGL-2 guidelines are designed to protect against carbon monoxide exposures of a concentration and duration that would be expected to produce carboxyhaemoglobin of four per cent. Both Dr Johnston and Professor Anderson advised that recent research suggests that there is a wide range of adverse health effects at lower carboxyhaemoglobin concentrations. They suggested that the Protocol should aim to produce carboxyhaemoglobin of less than two per cent, consistent with the World Health Organisation's guidelines.[86]

Dr Johnston further suggested that the Carbon Monoxide Response Protocol needs to clarify the use of procedures for the direction 'shelter in place' and community relocation in an emergency. Dr Johnston noted that effective protection of the community assumes rapid receipt of information by the community at any given time of the day or night, and pointed out the following issues of concern in relation to this:

- the extent of community confusion over repeated advice to commence and terminate 'shelter in place' advice
- the age of the housing stock in the Morwell area meant that houses may not provide sufficient protection from carbon monoxide in the event that it is recommended that residents 'shelter in place'
- the need to clarify the detailed procedures for a possible relocation of the community in an emergency
- a direction to 'shelter in place' may not be appropriate for increased levels of carbon monoxide exposure due to the unpredictable timing and duration of the carbon monoxide emissions.[87]

Professor Campbell advised the Board that he agreed with the reviewers that a lower level of carbon monoxide as the threshold would have been preferable and that as a clinician he would have preferred a margin of protection for vulnerable groups.[88]

Dr Lester was unable to confirm whether or not the Department of Health was provided with the peer reviews obtained by the EPA.[89] However, Mr Merritt told the Board that it was safe to assume that the EPA peer reviews of the Carbon Monoxide Response Protocol were provided to the Department of Health.[90] Dr Torre said that he assumed that the peer reviews were passed onto the Department of Health.[91] The Victorian Government submitted, after the conclusion of the hearings, that the review by Ms Denison included consideration of the comments from Dr Johnston and Professor Anderson.[92] However, there is no evidence before the Board to support this submission.

COMMUNITY RESPITE CENTRE AND HEALTH ASSESSMENT CENTRE

COMMUNITY RESPITE CENTRE

The Department of Human Services (DHS) established a community respite centre in Moe on 19 February 2014, to provide local community members with a place to go to limit their exposure to smoke.[93] The Victorian Government submitted that the community respite centre was established in line with the advice of Dr Lester that Morwell residents should limit their exposure to the smoke where possible.[94]

Mr Alan Hall, State Recovery Coordinator, informed the Board that the respite centre provided a cool, air conditioned space where any resident could take a break from the smoky conditions. He further informed the Board that free transport to attend the centre was provided to those who were aged, disabled or otherwise required transport assistance. DHS, Ambulance Victoria, Victoria Police, EPA, the CFA, relief agencies (including the Red Cross and Victoria Council of Churches), and Latrobe City Council personnel staffed the centre.[95]

The Board heard from community members that the community respite centre worked well, in particular that staff were helpful and that there was a variety of information provided.[96] The Board also heard that the centre would have been more useful if opening hours were extended, and if a similar centre was also established in Morwell for community members who were unable to travel to Moe.[97]

HEALTH ASSESSMENT CENTRE

Dr Brook informed the Board that although local health services were able to meet demand during the Hazelwood mine fire, the Department of Health recognised that the community remained concerned about the potential adverse health effects of smoke and ash. The Department of Health therefore established a health assessment centre to address this ongoing concern.[98]

Dr Brook stated that the health assessment centre supplemented local medical resources and provided information and reassurance to the community. He described the reasons behind establishing the centre as follows:

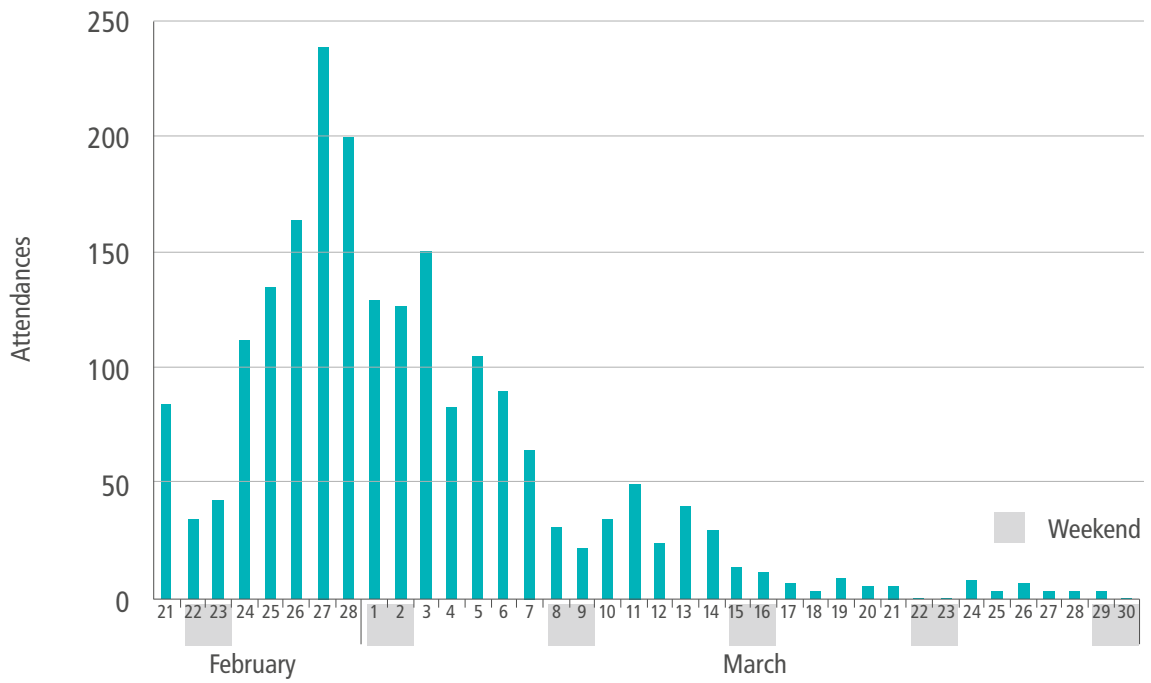
> We did so very conscious of what we were trying to do, which was not to replace primary care, not to replace general practitioners, not to replace Latrobe Regional Hospital and its emergency department, nor load onto it new activities that an emergency department doesn't need, but to provide a capacity for any body in the community to attend, free of charge, a centre that would provide basic health assessment, that would provide as it turns out measurement of carboxyhaemoglobin, that is, the impact of carbon monoxide in the blood, and to provide both information and reassurance through personal interaction.[99]

The health assessment centre opened at the Ambulance Victoria Regional Office in Morwell on 21 February 2014, and was staffed by paramedics and nurses. The health assessment centre:

- provided information, assessment, reassurance and referral services to residents and visitors who had health-related concerns arising from smoke and ash from the Hazelwood mine fire
- performed basic health checks
- provided carbon monoxide monitoring
- delivered medical care as needed
- provided referral to a local general practitioner or emergency department as required.[100]

The centre saw 2,072 individuals during its operation.[101] Dr Lester informed the Board that data from the health assessment centre indicated multiple attendances of people with non-life threatening symptoms, however it did not suggest presentation of any serious medical concerns in relation to the fire.[102] The daily attendances at the health assessment centre are demonstrated in Figure 4.53 below.

Figure 4.53 Daily attendance at the community health assessment centre[103]



The health assessment centre was generally well received by the community.[104] The Victorian Council of Social Service submitted that the venture was an excellent example of local partnering between nurses from local community organisations and Ambulance Victoria.[105]

Some residents told the Board that the location of the health assessment centre was impractical. Ms Julia Browell of Morwell submitted that it was difficult for residents who did not have a car to get to the centre, as they were required to walk along busy roads and in the smoke from the closest bus stop.[106] Mr Robert Jackman, Morwell resident, stated that he had difficulty initially locating the centre, which he attributed to Latrobe City Council's lack of information about it.[107]

Local general practitioners informed the Board that it might have been better for local doctors to be present at the health assessment centre, rather than a representative from the Department of Health, as the community looks to a local leader to confirm their experience in an emergency.[108]

The health assessment centre received a Public Safety Award from the Association of Public-Safety Communications Officials Australia.[109]

RESPITE MEASURES

FACE MASKS

The Department of Health distributed P2 face masks at the community respite centre, the community health assessment centre and mobile information points.[110] Mr Antony John of Morwell considered the dust masks to be inadequate for the respiratory protection required during exposure to particulate matter. He was also concerned that the dust masks did not fit children or babies.[111]

Figure 4.54 Children in Morwell wearing face masks

Image Source *Newspix / News Ltd*

OTHER RESPITE MEASURES

The Victorian Government initiated a number of other measures to assist the community to seek respite from the smoke. Ms Merita Tabain, Chair of the Emergency Management Joint Public Information Committee, told the Board that: 'We were looking around for community events that were outside of the area to give people an opportunity to leave.'[112]

Additional respite measures included:

- 13,500 people travelled for free to and from Morwell on V/Line
- 171 people received free entry to Melbourne Museum venues
- 5,372 people received free entry to Zoos Victoria zoos
- free transport and food and drink vouchers were provided to the Morwell community to attend activities in neighbouring communities.[113]

Scouts Victoria also offered free temporary accommodation at popular campsites across Victoria.[114]

The Victorian Government introduced a 'holiday house scheme' to provide accommodation support.[115] At the community consultation on 8 May 2014, the Board heard that the community did not think that the holiday house scheme worked well.[116] Ms Tracie Lund, Morwell Neighbourhood House Coordinator, described her frustration at trying to find required information about the holiday house scheme. She told the Board that as the coordinator of the local Neighbourhood House she received calls from residents who were willing to offer their house as a part of the program. However, she had difficulty knowing where to forward this information.[117]

Latrobe City Council was the contact point for the scheme. Mr John Mitchell, Acting Chief Executive Officer of the Latrobe City Council, told the Board that there was some confusion about the execution of the scheme when it was initially announced as details about the scheme were still being finalised.[118]

TEMPORARY RELOCATION ADVICE

ELEVATED LEVELS OF $PM_{2.5}$

In addition to elevated carbon monoxide levels during periods of the mine fire, the community was also exposed to elevated levels of $PM_{2.5}$. Dr Lester told the Board that the longer the duration of exposure to $PM_{2.5}$, the greater the risk.[119]

Figure 4.55 Validated and indicative $PM_{2.5}$ levels for Morwell and Traralgon from 9 February 2014 – 31 March 2014 (daily averages)[120]

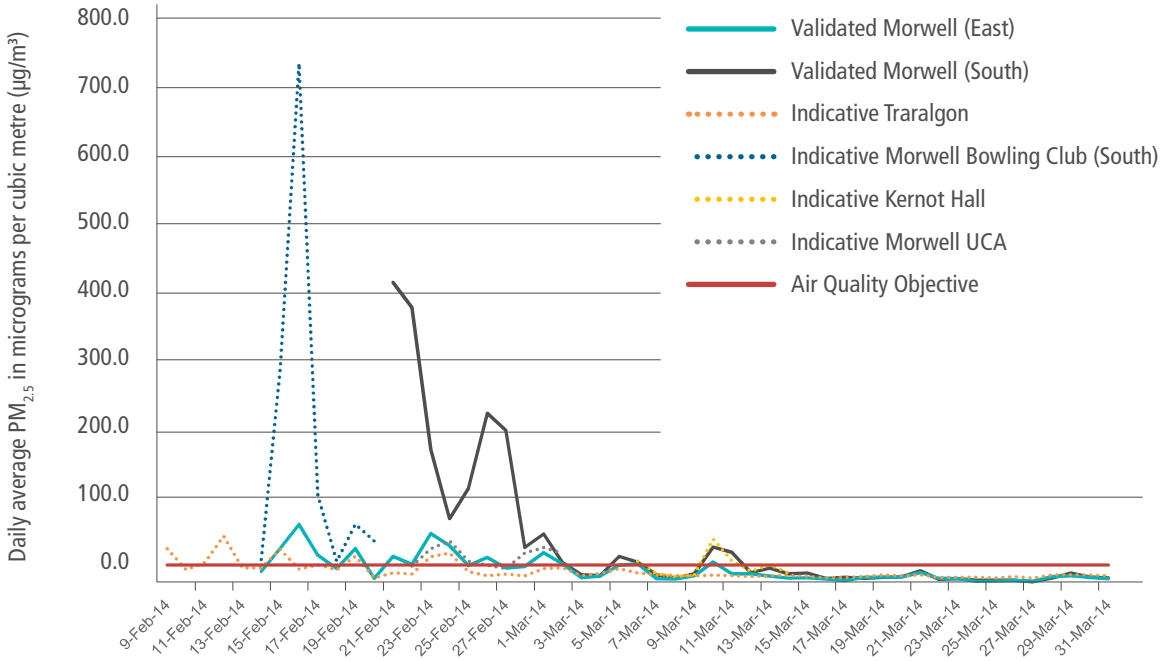


Figure 4.55 adapted from an EPA graph shows indicative data and validated data for $PM_{2.5}$ levels in February and March 2014, in the area around the Hazelwood mine fire. The dotted lines represent indicative data and the solid lines represent validated data. The Figure demonstrates that there were three key peaks of elevated $PM_{2.5}$ readings, particularly at the monitoring station at the Morwell Bowling Club (South). The peak periods were from 15–18 February 2014, 21–25 February 2014 and 26–28 February 2014. As detailed in Chapter 4.3 Environmental effects and response, the peak hourly reading of $PM_{2.5}$, recorded via the DustTrak, during the Hazelwood mine fire was just below 1200 µg/m³.

It is unclear from the evidence before the Board how much indicative data was provided to the Department of Health during the Hazelwood mine fire. However the EPA did provide some indicative data to the Department of Health before providing validated data. From 16 February 2014, the Department of Health received validated $PM_{2.5}$ reports from the EPA for the eastern part of Morwell, and indicative data for the southern part of Morwell.[121] Dr Torre advised the Department of Health via email on 16 February 2014, that the levels recorded in the southern area of Morwell were around two and a half to three times higher than in the eastern area of Morwell.[122]

From 22 February 2014, the Department of Health received validated $PM_{2.5}$ reports from the EPA for the southern part of Morwell.[123]

Figure 4.56 Validated $PM_{2.5}$ levels for Morwell from 15 February 2014 – 23 March 2014 (24 hour rolling average)[124]

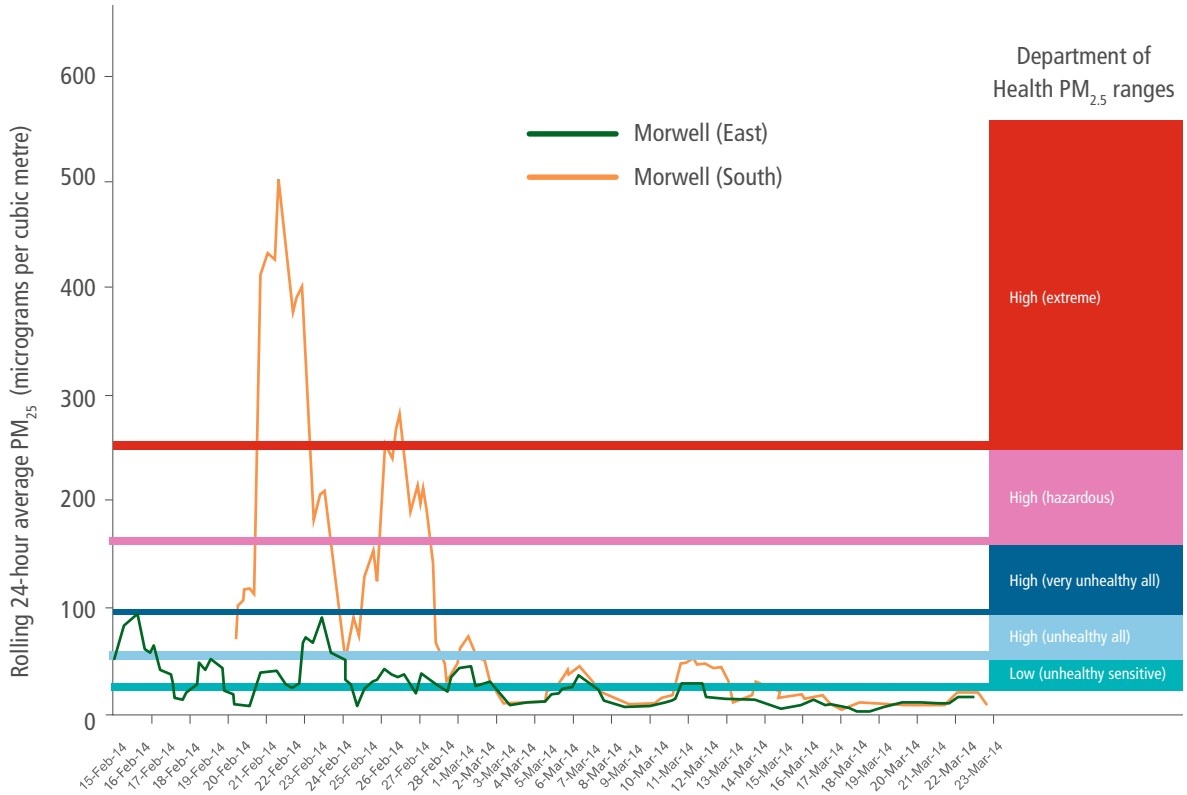


Figure 4.56 adapted from a Department of Health graph shows the validated levels of $PM_{2.5}$ recorded in Morwell from 16 February 2014 until 22 March 2014, together with the corresponding Department of Health ranges for the levels of air quality. The orange line represents the levels recorded at the Morwell Bowling Club (South) monitoring station and the green line represents the levels recorded at the Hourigan Road, Morwell (East) monitoring station. The Figure demonstrates that there were two key peaks of validated $PM_{2.5}$ recorded at the Morwell Bowling Club (South) air monitoring station, where the levels were considered by the Department of Health to be 'high (extreme)'. The peak periods were between 21–25 February 2014 and 26–28 February 2014.

$PM_{2.5}$ HEALTH PROTECTION PROTOCOL

On 25 February 2014, the Department of Health with the assistance of the EPA, developed a protocol to provide a decision-making tool to assess the risks and appropriate responses to high levels of $PM_{2.5}$ in the Morwell community, in particular in the area south of Commercial Road close to the Hazelwood mine.[125]

The $PM_{2.5}$ Health Protection Protocol outlines six levels of air quality based on the 24 hour rolling average of $PM_{2.5}$ and the appropriate action for each level. The six air quality categories are: 'good', 'unhealthy–sensitive', 'unhealthy–all', 'very unhealthy–all', 'hazardous', and 'extreme'. Each air category is accompanied by detailed cautionary health advice and actions (see Figure 4.57).[126]

Figure 4.57 Smoke advisory levels for $PM_{2.5}$ (24 hour rolling average) and cautionary advice for increasing health impacts[127]

Smoke advisory level	Air Quality Categories	$PM_{2.5}$ 24 hr µg/m³	Potential health effects	Cautionary health advice/actions
Not applicable	Good	<25	Meets the relevant air quality standard	None
LOW	Unhealthy sensitive	26–55	People with lung or heart conditions, elderly, children	**Sensitive groups:** People with heart or lung conditions, children and older adults should **reduce** prolonged or heavy physical activity No specific message for everyone else other than sensitive groups
HIGH – General	Unhealthy – all	56–95	**Increased** likelihood of effects for people with lung or heart conditions, elderly, and children General population respiratory symptoms	**Sensitive groups:** People with heart or lung conditions, children and older adults should **avoid** prolonged or heavy physical activity Everyone else should **reduce** prolonged or heavy physical activity
HIGH – General	Very unhealthy – all	96–156	**Increased** likelihood of effects for people with lung or heart conditions, elderly, and children General population respiratory symptoms	**Sensitive groups:** People with heart or lung conditions, children and older adults should **avoid all** physical activity outdoors Everyone else should **avoid** prolonged or heavy physical activity
HIGH – Hazardous	Hazardous	157–250	**Significant** likelihood of effects for people with lung or heart conditions, elderly, and children **Increased** likelihood of respiratory symptoms in the general population	**Sensitive groups:** People with heart or lung conditions, children 5 years and younger, pregnant women and people over 65 years should **temporarily relocate** to a friend or relative living outside the smoke-affected area. If this is not possible, **remain indoors** and **keep activity levels as low as possible** **Consider closing** some or all **schools** until air quality improves Everyone should **avoid all** physical activity outdoors. Healthy people with symptoms should seek medical advice and take a break away from the smoky conditions. **Reschedule outdoor events** eg. concerts and competitive sports schools until air quality improves
HIGH – Extreme	Extreme	>250	**Serious** likelihood of effects for people with lung of heart conditions, elderly, pregnant women and children Respiratory symptoms in the general population	Cautionary health advice/actions the same as for HIGH–Hazardous above except for sensitive groups **Sensitive groups:** If the 24 hour rolling average $PM_{2.5}$ values remain in this category for two days and are predicted to continue at this level or increase: People with heart or lung conditions, children 5 years and younger, pregnant women and people over 65 years are **strongly recommended** to temporarily relocate until there is sustained improvement in air quality

Dr Lester told the Board that the primary objective of the $PM_{2.5}$ Health Protection Protocol was to prevent vulnerable groups from spending more than three days in an atmosphere of a level of more than 250 µg/m³ of $PM_{2.5}$.[128]

The $PM_{2.5}$ Health Protection Protocol includes a detailed procedure that should be followed if the $PM_{2.5}$ levels exceed 250 µg/m³. This procedure describes:

- when to notify the Department of Health
- when the Department of Health's Health Risk Assessment Team should be activated
- the required continuous air monitoring and reporting to the Department of Health (including actual and predicted results) from the EPA
- issuing the subsequent advice from the Chief Health Officer.[129]

Essentially, the $PM_{2.5}$ Health Protection Protocol provides that if the $PM_{2.5}$ levels reach the extreme level (greater than 250 µg/m³) for two days and are predicted to stay at this level or to increase, the Department of Health's Health Risk Assessment Team is activated and determines whether 'the Chief Health Officer should strongly recommend that sensitive groups temporarily relocate until the air quality improves for a sustained time (see Figure 4.58).'

Figure 4.58 Summary of $PM_{2.5}$ response procedure between Department of Health and EPA[130]

	Days of exposure to air		
Action points	**T=24 hours**	**T=36 hours**	**T=48 hours**
Notification and updates	EPA notifies DH on-call Officer if $PM_{2.5}$ (24 hour rolling average value) is > 250 µg/m³	EPA updates DH (see below)	EPA updates DH (see below)
Monitoring and Assessment		EPA provides DH with: • the last 12 hrs of $PM_{2.5}$ rolling average values • qualitative prediction of change in smoke intensity over the next 12 hours	EPA provides DH with: • the last 12 hrs of $PM_{2.5}$ rolling average values • qualitative prediction of change in smoke intensity over the next 12 hours
Decision		No activation of DH Health Risk Assessment (HRA) Team if: • the 12th hour 24 rolling average value (which represents 36 hours of community exposure) for $PM_{2.5}$ is ≤ 250 µg/m³ **and** • the smoke intensity is predicted to decrease **OR** **Alert** DH HRA Team and continue assessment of monitoring data for the next 12 hours if $PM_{2.5}$ (rolling 24 hour average) is >250 µg/m³ and current smoke intensity is predicted to remain the same or increase	No activation of DH Health Risk Assesment (HRA) Team if: • the 12th hour 24 rolling average value (which represents 48 hours of community exposure) for $PM_{2.5}$ is ≤ 250 µg/m³ **and** • the smoke intensity is predicted to decrease **OR** **Activate** DH HRA Team if $PM_{2.5}$ (rolling 24 hour average) is >250 µg/m³ and the current smoke intensity is predicted to remain the same or increase over the next 12 hours

	Days of exposure to air		
Action points	**T=24 hours**	**T=36 hours**	**T=48 hours**
Chief Health Officer – subsequent advice/ actions			The issue of further advice by the Chief Health Officer involves factors in addition to an improvement in air quality: fire suppression status, plume predictions, weather outlook information etc. Any advice from the Chief Health Officer will therefore be made in consultation with the Fire Services Commissioner, EPA, CFA, DHS and VicPol.

DH = Department of Health

PEER REVIEW OF THE $PM_{2.5}$ HEALTH PROTECTION PROTOCOL

On 4 March 2014 the Department of Health had the $PM_{2.5}$ Health Protection Protocol peer reviewed by Ms Denison.[131] Ms Denison considered that the $PM_{2.5}$ Health Protection Protocol was consistent with international approaches to public health warnings associated with bushfire (or wildfire) smoke. She also considered that the $PM_{2.5}$ levels included in each range were consistent with international systems and 'provides [sic] appropriate advice to minimise the adverse effects of the smoke on these [sensitive] groups.'[132] She was also of the view that allowing three consecutive days of extreme levels before recommending temporary relocation was consistent with addressing the increasing risk arising from several days of constant exposure.[133] Ms Denison made no suggestions for improvement to the $PM_{2.5}$ Health Protection Protocol.

Independent expert Ms Claire Richardson, Managing Director and Principal Consultant, Air Noise Environment Pty Ltd, advised the Board that a key difference between the Bushfire Smoke Protocol and the $PM_{2.5}$ Health Protection Protocol was that the latter did not have triggers for one hour levels. She also observed that the $PM_{2.5}$ Health Protection Protocol did not outline a time period within which to determine when specific actions were to be taken, such as relocation.[134]

On 5 March 2014, Dr Lester also sought review of the $PM_{2.5}$ Health Protection Protocol from the Australian Health Protection Principal Committee.[135] Different members of the Committee had different views on the Protocol.

Dr Paul Kelly, Australian Capital Territory Chief Health Officer, considered that the $PM_{2.5}$ Health Protection Protocol should allow for general advice to be triggered by different levels and associated health impacts, rather than making specific recommendations. He agreed that the level of high/extreme of 250 $\mu g/m^3$ in the Protocol was appropriate in light of the available evidence.[136]

Mr Roscoe Taylor, Tasmania Chief Health Officer, was of the view that the $PM_{2.5}$ Health Protection Protocol's defined action levels and actions had the potential to work against a more precautionary approach to early warnings.[137]

The New South Wales Department of Health was concerned that a number of comments in the $PM_{2.5}$ Health Protection Protocol did not have a sound scientific or evidentiary basis, namely the comment that the effects of exposure to $PM_{2.5}$ are cumulative and that there is a link between exposure and harm to foetuses. The Department considered the individual risk from $PM_{2.5}$ to be so small as to be unlikely to justify a government recommendation for relocation. The Department was concerned the $PM_{2.5}$ Health Protection Protocol could set an 'unjustified precedent'.[138]

Seventeen committee members of the Australian Health Protection Principal Committee (out of 22) were unable to respond within the required timeframe or did not provide substantive responses.[139]

There was no evidence before the Board that the EPA sought a peer review of the $PM_{2.5}$ Health Protection Protocol.[140]

ADVICE ON 28 FEBRUARY 2014

On 26 and 27 February 2014, Dr Lester became concerned about the significant decrease in air quality.[141]

On 27 February 2014, Dr Lester discussed her intention to issue temporary relocation advice at a meeting of the State Crisis and Resilience team.[142] Dr Lester also discussed her intention to issue the temporary relocation advice with Associate Professor Louis Irving, respiratory physician, Dr Johnston, public health physician, and the Environmental Health Standing Committee.[143] Comments from the Committee included that a tiered approach was an appropriate way to respond to the situation, however other Committee members were concerned that the proposed temporary relocation advice (to be announced the next day) may set an 'inappropriate precedent'.[144]

On the morning of 28 February 2014, a meeting was held in Morwell and was attended by Dr Lester, Mr Lapsley, Mr Ken Lay, Chief Commissioner of Police, Mr Merritt, Cr Sharon Gibson, Latrobe City Council Mayor, Mr Mitchell, and various other departmental representatives. The purpose of the meeting was to discuss the proposed temporary relocation advice.[145]

Mr Mitchell told the Board that the map shown in Figure 4.59 was circulated at the meeting to demonstrate air quality in different areas of Morwell.[146] He read the map as indicating a very strong concentration of air pollution in one area (which he indicated was in the area south of Commercial Road), and another 'bubble' at McDonald's Road.[147]

Figure 4.59 Distribution of pollution as indicated by $PM_{2.5}$ levels in Morwell on 22 February 2014[148]

Greater than 250 µg/m³
Between 100-250 µg/m³
Between 0-100 µg/m³
Commercial Road

In the early afternoon of 28 February 2014, Dr Lester advised vulnerable groups (preschool aged children, pregnant women, people with pre-existing heart and lung conditions and people over 65 years) to temporarily relocate from the area south of Commercial Road in Morwell.[149]

Dr Lester told the Board she issued the advice because she was concerned that the levels of $PM_{2.5}$ had started to increase on 26 February 2014, and that on 27 February 2014 she had specific advice from Mr Lapsley that the fire was likely to burn for at least two more weeks.[150] Dr Lester was concerned that if the $PM_{2.5}$ levels continued to increase they would exceed 250 µg/m³ for three days, and that vulnerable

groups had been in the smoke long enough.[151] Dr Lester confirmed that the advice was not to evacuate but rather that residents should consider temporary relocation.[152]

When asked by the Board why she did not issue the temporary relocation advice earlier, Dr Lester responded:

> The risk of adverse events happening increases – the longer people are exposed to the smoke, the risk of adverse events increases. The actual level of the smoke, as you've seen from the $PM_{2.5}$ graph, varied quite considerably across that time. We needed to give advice, which was proportionate to the risk of what we were seeing.[153]

COMMUNITY RESPONSE TO RELOCATION ANNOUNCEMENT

Community members informed the Board that they considered Dr Lester's temporary relocation advice on 28 February 2014 to be inconsistent with her earlier advice that it was safe to stay in the area. Ms Wilson stated:

> I felt, when she did come out and say, "We recommend you relocate", and it was only a matter of days before we'd heard everything is fine, no one needs to relocate, I just felt inadequate, I just felt like everything that I had portrayed to people about what we were doing was right and informed and considered, became something of, "You would have been better off just trusting yourself and your family rather than an expert".[154]

Dr Lester did not consider that the advice to relocate was inconsistent with her earlier advice, but rather that it was an extension of ongoing advice to avoid exposure to the smoke if possible. She told the Board that she was continuing to emphasise the message to take regular breaks from the smoke as the fire progressed and that the temporary relocation advice was an escalation of this.[155]

Ms Julie Brown of Morwell, submitted to the Board that she felt let down by the Department of Health because 'they did not have scientific certainty that this health risk did not pose a serious threat and allowed people of Morwell to be exposed to an obvious risk.'[156]

Ms Wheatland told the Board: 'I think the advice that we got was late, I don't think that it was considered in the context of the vulnerable people that are living in the community. It should have been earlier.'[157] She also described the temporary relocation advice–so late after the commencement of the fire–as 'quite unsettling'.[158]

Professor Campbell told the Board that from a clinician's perspective, the spikes of $PM_{2.5}$ were very concerning and that he would have erred on the side of being concerned. However, he did not specify what action should have been taken.[159] He told the Board:

> Well, look, we're dealing with a complex issue, we have an information deficit, we don't have the information that would give us a definitive answer but we have to make a decision, and to not make a decision is to make a decision; so you don't have a choice, you've got to make a decision. It's either, it is or it isn't.[160]

The Board heard significant concern from the community about the use of Commercial Road as the dividing line for the temporary relocation advice, and in particular the use of the term 'Morwell South'. The Board received a submission from Mr Fred Burns of Moe who stated that the continued use of 'Morwell South' by Dr Lester gave the impression that the other parts of Morwell (in particular north of the railway line) were less affected by smoke, ash and fine particles in the air.[161]

RELOCATION OF SCHOOLS AND CHILDREN'S SERVICES

Latrobe City Council and the Department of Education and Early Childhood Development (DEECD) share responsibility for schools and children's services located in Morwell. The Council and DEECD took different approaches to the management of schools and children's services in the area during the Hazelwood mine fire.

At community consultations, the Board heard that the community felt primary schools were not provided with adequate information about the health risks of the fire, and that schools were left to make their own decisions about relocation.[162]

LATROBE CITY COUNCIL

Latrobe City Council is responsible for an early childhood centre (which is a combined centre with Carinya Early Learning Centre), a maternal child health centre and two preschools in Morwell.[163]

On 9 February 2014, the Council made a decision to close all preschools and maternal and child health centres in the Council area for the following day. The Carinya Early Learning Centre was also closed because it comprises both a preschool and an early learning centre. The primary reason for the closure of preschools and maternal and child health centres was access difficulties due to road closures as a result of bushfires in the area.[164]

Maryvale Crescent Preschool is located very close to the Hazelwood mine and did not reopen until after the mine fire was declared safe.[165] Mr Mitchell told the Board that due to its location and the impact of the smoke and ash, the Council took the view that it was 'completely untenable to have children and staff within that centre.'[166] After a period of closure on, 24 February 2014 the centre was relocated to Moe.[167]

All services reopened on 11 February 2014 (except for the Maryvale Crescent Preschool). Mr Mitchell told the Board that services were reopened with an indoor program, however as the fire went on it became obvious that there was going to be sustained smoke and adverse conditions.[168]

On 26 February 2014, the Council decided to close all preschools in Morwell, as well as the Carinya Early Learning Centre. Mr Mitchell informed the Board that the decision was made because children were frustrated at remaining inside and some were affected by smoke filtering through the doors and vents.[169] He further stated: 'The question of staff was also an issue, managing children indoors all day was a challenge for the staff, and then there was also the other principle about respite for both children and our teachers.'[170]

All preschools, early learning centres and maternal and child health centres resumed normal operations on 24 March 2014.[171]

DEPARTMENT OF EDUCATION AND EARLY CHILDHOOD DEVELOPMENT

DEECD Emergency Management Division provides policy and operational direction for all government schools and children's services in respect of emergency management. In addition, pursuant to a Memorandum of Understanding with the Catholic Education Commission of Victoria, Independent Schools Victoria and the Municipal Association of Victoria, DEECD has responsibility and authority as the lead agency for overall coordination of education services in an emergency.[172]

In Morwell there are nine children's services, five government schools, two Catholic schools, one independent school and one TAFE. Three of the schools (Commercial Road Primary School, Sacred Heart Primary School and Berry Street School) and two children's services (Maryvale Crescent Kindergarten and Goodstart Early Learning Centre) are located south of Commercial Road Morwell and within 0.8 and 1.3 kilometres of the mine.[173]

Mr Nicholas Pole, Deputy Secretary of the Regional Services Group at DEECD noted in his statement to the Board that DEECD relied on the advice of Dr Lester regarding how the impact of smoke on child/student and staff health should be minimised.[174] Mr Pole stated that DEECD was looking to Dr Lester for qualitative analysis of any air quality data.[175]

At the State Emergency Management Team meeting on 12 February 2014, DEECD raised the issue of air quality and the potential impact on schools and children's services close to the mine.[176] Mr Pole told the Board that from an early stage, DEECD was concerned about the quality of air in the facilities.[177]

By 13 February 2014, Mr Pole was aware that school principals in Morwell were frustrated about the lack of clear advice on air quality issues:[178]

> …frustration in regard to, firstly, the impact of that on the operation of the schools. So in effect, schools were keeping kids inside… rainy day arrangements, so we have kids inside in classrooms through the entire day… and in addition concern or a lack of knowledge and information about the potential health impacts of the smoke.[179]

Mr Pole stated that the advice being given did not reduce the level of frustration and therefore DEECD planned to commence air monitoring at schools.[180]

On 18 February 2014, DEECD sought advice from Dr Lester to assist it to determine whether it should consider relocation and the closure of schools and children's services.[181] DEECD reported to Dr Lester that Goodstart Early Learning Centre had informed it of children exhibiting hyperactivity, headaches, flushed faces and longer sleep times.[182] Dr Lester responded via email:

> …on the basis that some children from one of your early learning facilities have reported symptoms which would be consistent with smoke exposure, and the fact that our recommendation has been for the past couple of days for vulnerable people to spend time out of the smoke if possible, we would advise that your facilities south of Commercial Rd (ie nearest to the time [sic]) are closed and/or have provision for temporary relocation of the children out of the smoke.[183]

Mr Pole told the Board that he understood Dr Lester's advice to mean that the symptoms reported by the school were consistent with carbon monoxide exposure.[184]

On 18 February 2014, DEECD commenced planning of possible relocation of schools and children's services.[185]

The same day DEECD also resolved to undertake air monitoring at all schools and children's services in Morwell. Monitoring was conducted in 21 facilities with hand-held devices that measured carbon monoxide, carbon dioxide and PM_{10}.[186] Mr Pole said that the air monitoring devices 'were to assist principals in their decisions about having children go outside classrooms and to ventilate classrooms and classroom spaces.'[187]

The results of the air monitoring provided to the Board indicate that for the majority of the continuous monitoring recordings, the readings were considered low risk; however there were some occasions where the level of PM_{10} recorded was in the medium risk category, and on one occasion (at Morwell Primary School on 27 February 2014), the readings were in the high risk category.[188]

On 19 February 2014, DEECD advised Mr Lapsley of its decision to temporarily relocate schools and early childhood facilities located south of Commercial Road.[189] Mr Pole told the Board that there was a concern that the community may see the relocation of the schools as a mixed message, as the community was being told that unless you were in a vulnerable group it was safe to stay in Morwell.[190] By 19 February 2014, Goodstart Early Learning Centre and Dala Lidj-Woolum Bellum Kindergarten had closed pending relocation.[191]

On 20 February 2014, Commercial Road Primary School and Sacred Heart Primary School (both located south of Commercial Road) were relocated. A third school located south of Commercial Road (Berry Street School) had been closed since 13 February 2014. By 27 February 2014, four other children's services in Morwell (all north of Commercial Road) had closed or announced their intention to close, pending the identification of appropriate accommodation.[192]

Schools that were not relocated were encouraged to undertake respite activities at locations with better air quality.[193] Figure 4.60 shows the location of schools and early learning centres in Morwell on 4 March 2014, and whether they had been relocated, closed or remained open.

Mr Pole confirmed that DEECD's approach was to use Commercial Road as a dividing line and to provide different advice to facilities south of Commercial Road and north of Commercial Road. Latrobe City Council did not distinguish between facilities located on either side of Commercial Road.[194]

Figure 4.60 Location and status of schools and early learning centres, Morwell, 4 March 2014[195]

By the start of Term 2 on 22 April 2014, all schools and children's services in Morwell had been cleaned and staff and students had returned.[196]

ADVICE TO EMPLOYERS

On 18 February 2014, the Victorian WorkCover Authority (VWA) issued a media release in relation to air quality and workplace safety in the Latrobe Valley. The media release provided that workplaces should:

- take steps to reduce the impact of bushfire and coal fire smoke on their staff
- take note of the advice issued by the Department of Health in relation to people undertaking strenuous activity outdoors, particularly those with pre-existing heart and lung conditions
- keep abreast of the community updates from the EPA and the Department of Health
- be particularly alert to variable air quality and monitor the EPA and Department of Health websites for updated information, if operating near the Hazelwood coal mine fire
- review systems of work and consider if measures need to be put in place to protect staff from the risks associated with smoke
- consider reassigning staff with pre-existing conditions to non-strenuous, indoor work
- have a conversation in your workplace about the conditions and encourage staff to speak up if they identify any risks to health and safety.

The media release further advised that smoke haze was affecting visibility in some areas, which may pose risks to staff operating machinery and equipment. Subsequently, if conditions made it difficult to see the workspace and other surroundings, work should be postponed.[197]

Mr Leonard Neist, Executive Director, Health and Safety at VWA, agreed that the advice provided in the media release was very general.[198] However, he stated that:

> Employers know it's their duty to provide a safe workplace for their employees. The Department of Health and EPA were putting out those other warnings, so this refers employees to seek that information from the appropriate Department, as to what the special conditions are in terms of the smoke and the ash and the bushfire fall out. In terms of trying to cover off every workplace in a given area at any time, you can't go into the specifics of every workplace in a single notice. I think this is reminding people of their duty to ensure a safe workplace for their employees, and it's referring to specific categories that WorkSafe was aware of that needed specific attention, but it also refers them to the EPA and the Department of Health to seek further updates as to what those requirements are; in short, so that they can enforce their duty.[199]

From 5 March 2014, VWA had an advisory team located in the Morwell Community Information and Recovery Centre (see Chapter 4.7 Relief and recovery). The team offered advice to employers and employees regarding the impact of the mine fire on health and safety in workplaces.[200]

Despite these measures, many community members felt that they did not receive adequate information to assist them to make decisions about their business.

Ms Wheatland told the Board:

> [it was] difficult to make a decision as to know what to do. The advice that we were getting initially was that everything was okay and that we were safe and there was no harm to communities, there was no action that we needed to take. But I just had to step inside the office or outside the office and know that that, and know myself, that that wasn't right.[201]

At the community consultation at Kernot Hall, Morwell, on 10 April 2014, the Board heard that community members felt there was no direction given to businesses about potential relocation out of smoke affected areas.[202] Ms Wheatland told the Board that she felt bad sending her staff out into conditions that she felt were unsatisfactory, however she had clients that she needed to know were safe and the best way to do that was to check their homes. She said: 'it's my role to make sure not only that our clients are safe but the staff as well.'[203]

Mr Mitchell advised that he had a difficult task balancing the needs of his staff with running the Latrobe City Council effectively for the community:

> [the conditions] were challenging from the very next day work opened… the fire really got started on the 9th and from the 10th there were challenging conditions within the office. I guess we were conscious, and I was conscious of our obligations in terms of health and safety, and I was also conscious of the need for the council to actually provide a service to the community and at the same time continue the business as usual functions of council as well.[204]

Mr Mitchell told the Board that the Council managed staff as best they could. Some staff had relocated immediately after the fire, some staff were already working remotely, and other decisions were made throughout the fire to provide respite to staff.[205]

Ms Brooke Burke, Morwell Business Owner, expressed some of the difficulties faced by small business employers. She told the Board that she had difficulty obtaining information about whether or not it was safe to keep the studio open during the fire, but found 'it was very hard to find someone that could tell us if we were or weren't [safe to open]. Obviously not being a Government agency, we didn't have anyone in direct contact with us as to whether the building was safe to be in.'[206] Ms Burke attempted to contact the Latrobe City Council to ask if there was someone to speak to about what local business should do. She was told that there was no one appointed at the time to assist local businesses.[207]

LONG-TERM HEALTH STUDY

The Latrobe Valley community is acutely aware of long-term risks from exposure to toxic chemicals, due to its experience with asbestos. The community is very concerned about the potential long-term effects of exposure to smoke and ash from the Hazelwood mine fire.

In order to address the research gap around potential long-term effects of short/medium-term exposure to smoke from a coal mine fire, the Department of Health has committed to undertake a long-term health study.[208]

On 6 and 7 May 2014, the Department of Health conducted a community consultation about the proposed study.[209] At this consultation, the primary concern of the community was the potential long-term impact on children of exposure to smoke and ash.[210]

The proposed duration of the study is 10 years. Dr Lester told the Board:

> I think it would be very ideal if the study continued longer than that. It really is not feasible for the government to be entering into contracts at this stage for any longer than 10 years. I would certainly be wanting to see the study continue for longer than that.[211]

In his report to the Board, Professor Campbell outlined a number of essential features of the proposed study. These include that the study:

- be for a duration of at least 20 years
- have the objective of improving the physical and mental health of the Latrobe Valley community
- be conducted under the governance of a steering committee that includes an independent chair and community representatives
- translate the outcomes of the study into improved health incomes for the community
- include research from meteorologists, environmental health physicians, occupational health physicians and mathematical modellers to develop better predictive tools to describe the conditions under which environmental hazards may arise in the future
- include regular reports to the community to ensure that they are informed of the progress of the study and the results
- have a primary focus on $PM_{2.5}$ exposure.[212]

He further advised that it is important to ensure that the community is the focus of and is involved in the study:

> My experience of dealing with the former power industry workers is that the community are very switched on and have a very good understanding of what are the important questions, and they need to be satisfied that those questions have been addressed and it hasn't been captured by the researchers for their own purpose. So I'll speak against me as a researcher and say that the researchers should be in service of the community and focus on outcomes.[213]

DISCUSSION AND CONCLUSIONS

IMPACT OF THE HAZELWOOD MINE FIRE ON HEALTH

The impact of the Hazelwood mine fire on the population of the Latrobe Valley and Morwell in particular, was significant on many levels. Chapter 4.5 Health effects demonstrates that the population of the Latrobe Valley already has significant health challenges and does not enjoy the levels of health and social wellbeing of most other Victorians. Latrobe Valley is also socially and economically disadvantaged relative to the rest of Victoria, which further exacerbates health conditions.

Throughout this report examples have been given of the significant health and social impacts of the Hazelwood mine fire. The Board considers these impacts have further compromised the poorer health and wellbeing of communities such that some residents feel more distrustful of government agencies and services than they previously did. Special attention and targeted action is required to change this and provide hope for current and future generations.

PROVISION OF HEALTH INFORMATION

The Board considers that the advice provided by the Department of Health in the low level and high level smoke advisories was generic and in the case of the Hazelwood mine fire, repetitive. Whilst it is commendable that the Department and the EPA had the foresight to develop a protocol in response to the known adverse health effects of bushfire smoke, the Protocol's effectiveness in response to the Hazelwood mine fire was questionable. The advisories to the community provided little practical advice about how to minimise the harmful effects of the smoke.

When a community is covered in smoke, residents need advice about how to protect themselves. Schools and businesses need advice about whether to close and if outdoor events should be cancelled. The Bushfire Smoke Protocol should contain a table of triggers detailing how and when people should respond to levels of smoke. The news media need to be informed about the level of danger. This advice should be included in a smoke management guide that comprises a suite of documents, including a revised Bushfire Smoke Protocol. Such a guide should be used to minimise the harmful effects of smoke on the community.

The Bushfire Smoke Protocol should be reviewed and amended to provide practical, clear and user -friendly guidelines. The Board recognises that the Victorian Government intends to review the existing Bushfire Smoke Protocol in its development of the State Smoke Plan by the end of September 2014, in preparation for the 2014/2015 summer bushfire season. This review will include integration of $PM_{2.5}$ equivalent values into the PM_{10} approach.[214] The Board affirms the proposal of the Victorian Government, however highlights that timeliness of the review is essential to ensure that the community has adequate protection and information prior to the next fire season.

ENGAGEMENT WITH GENERAL PRACTITIONERS AND HEALTH SERVICES

The Board is concerned with the lack of engagement by the Department of Health with general practitioners during the Hazelwood mine fire. Whilst the Department did seek input from general practitioners to understand the health demand, there is no evidence that they actively engaged with local general practitioners to ensure a consistent, effective health response in the community.

Local clinicians (general practitioners and specialists) may be more highly regarded and trusted by the community due to their existing relationships and knowledge of the local people, than officials from the Melbourne–based Department of Health. Engagement with local general practitioners would have assisted those practitioners to provide current and actionable information to patients, consistent with messages from the Chief Health Officer. It may have also assisted the Department of Health to engage with the local community more effectively.

Clear procedures, contact details and communication channels should be developed so that existing networks can be immediately contacted in the event of an adverse event. Regular two-way communication should be initiated and maintained with local practitioners by the Department of Health.

RESPONSE TO ELEVATED LEVELS OF CARBON MONOXIDE

The EPA reported very high levels of carbon monoxide to the Department of Health on 16 February 2014. If these readings were taken over a four hour period they were high enough to warrant at least a 'Watch and Act' alert, under the Carbon Monoxide Response Protocol. The Board was informed, however, that the Department of Health did not consider the measurements adequate for decision-making since the carbon monoxide data were 'spot readings'. On the basis of the information available to the Board, this course of action is of concern, and more so given the relatively high exposure levels that were applied in the Carbon Monoxide Response Protocol.[215]

Although the evidence does not provide a basis for detailed findings, it does appear that there was no attempt to derive one or four-hour average carbon monoxide levels from the indicative data that was available. Further, the Department of Health did not provide any evidence that prevailing or forecast weather conditions were taken into account in assessing the significance of that data, as required by both the Carbon Monoxide Response Protocol and the Protective Action Decision Guide.

The Board was informed that no adverse health effects from community exposure to carbon monoxide were detected on and after 16 February 2014.

The Board considers it unfortunate that the Department of Health did not have in place a pre-existing carbon monoxide protocol to provide advice to the community about elevated levels of carbon monoxide. However in light of this, it was appropriate for the EPA and the Department of Health to develop a protocol to assist in decision-making.

The Board commends the Department of Health and the EPA for obtaining peer reviews of the Carbon Monoxide Response Protocol. The utility of the peer reviews would have been increased substantially if they were obtained more promptly and the results provided to the community. The expert peer reviews raised a number of concerns about the Protocol that are shared by the Board, in particular the use of the AEGL-2 guidelines for a protocol that was designed for a non-acute period.

Dr Lester was unable to confirm whether or not the Department of Health was provided with the peer reviews obtained by the EPA.[216] The Department of Health and the EPA should make certain that they share all information obtained about environmental health protocols to ensure that the decision-making process is fully informed, and to provide optimal advice and protection to the community.

To ensure that the Department of Health and the EPA are prepared in the event that increased levels of carbon monoxide are experienced in the future, the Carbon Monoxide Response Protocol should be revised and finalised. In particular, the use of the AEGL-2 as the guide should be carefully reviewed for application to situations where there may be increased levels of exposure for greater than 24 hours. An independent panel appointed by the Emergency Management Commissioner should conduct the review.

The revised carbon monoxide protocol should specify who will monitor carbon monoxide in the community and by what means, the types of locations suitable for monitoring, how the results will be assessed to provide information for decision-making, trigger levels for action for specific risk categories (eg age groups, health conditions, other risk factors), and response actions according to each trigger level. Once agreed, the carbon monoxide protocol should be distributed to police, health services, local government, emergency services and any other relevant organisations to ensure a consistent response to future events.

The Board is concerned about the inconsistency between the Carbon Monoxide Response Protocol developed by the Department of Health to protect the community and the Health Management and Decontamination Plan developed by the CFA to protect firefighters from exposure to elevated levels of carbon monoxide (discussed in Chapter 4.4 Firefighter health). The Health Management and Decontamination Plan for firefighters at the mine provided that if the level of carbon monoxide exceeded 50 ppm they were required to wear breathing apparatus and if the level exceeded 75 ppm, they were required to put on breathing apparatus and immediately leave the area. By contrast, the Carbon Monoxide Response Protocol for the community required that if levels exceeded 70 ppm for more than one hour then the Department of Health would convene an internal assessment team and review the available information in light of the response matrix. That is, levels that were not considered safe for firefighters and required evacuation did not require the same response if the level was measured in the community. This inconsistency in the protocols was not satisfactorily explained to the Board and remains of concern.

The only explanation proffered for the different levels adopted in the Carbon Monoxide Response Protocol (community) and the Health Management and Decontamination Plan (firefighters) was that carbon monoxide levels are usually higher close to a coal fire and usually dissipate rapidly in the open air. However, the following concerns have not been addressed:

- Firefighters are generally fit adults. The same generalisation cannot be made about the community, which includes people in a range of vulnerable groups.
- Firefighters are screened. Pursuant to the Health Management and Decontamination Plan and those with pre-existing vulnerabilities and carboxyhaemoglobin levels over five per cent are excluded. Community members are not screened in the same way – everyone is exposed, including the vulnerable and those who already have high carboxyhaemoglobin levels.
- The AEGLs are only appropriate for short-term or acute exposures, ie up to eight hours. It follows that they may not be appropriate exposure standards for a longer incident.

The Board recommends that the firefighter carbon monoxide protocol (detailed in the Health Management and Decontamination Plan) be reviewed before the next fire season. The firefighter carbon monoxide protocol should be consistent with the community carbon monoxide protocol. As with the community protocol, the Emergency Management Commissioner should appoint an independent panel to conduct the review. The revised firefighter carbon monoxide protocol should also specify the types of locations suitable for monitoring, how the results will be assessed to provide information for decision-making, trigger levels for action for specific risk categories (eg age groups, health conditions, other risk factors), and response actions according to each trigger level. Once agreed, the firefighter carbon monoxide protocol should be distributed to the emergency services, the Victorian coal mining industry and other industries where carbon monoxide poisoning during firefighting may occur.

GDF Suez should adopt and apply the revised firefighter carbon monoxide protocol. The Board affirms that GDF Suez have committed to doing this in consultation with VWA and the CFA.[217]

HEALTH ASSESSMENT CENTRE

The Board commends the Department of Health for establishing the health assessment centre. The centre provided the community with an additional resource to provide health information, guidance and reassurance. The effectiveness of the centre would have been enhanced if local general practitioners had been asked to visit the centre to demonstrate their support and to reassure the community that appropriate measures were in hand.

$PM_{2.5}$ HEALTH PROTECTION PROTOCOL

The Board considers that the development of the $PM_{2.5}$ Health Protection Protocol, whilst appropriate as a guideline for decision-making, was developed too late by the Department of Health. By the time the protocol was in place, the local community had already been subjected to elevated levels of $PM_{2.5}$ for over two weeks.

The $PM_{2.5}$ Health Protection Protocol should be reviewed and finalised to ensure that there is a protocol in place before another emergency of this nature occurs. The Emergency Management Commissioner should appoint an independent panel to conduct the review. The revised protocol should specify who will monitor fine particles in the air across the Latrobe Valley and by what means, the suitability of locations for monitoring, how the results will be assessed to provide information for decision-making, trigger levels for action for specific risk categories (eg age groups, health conditions, other risk factors) and response actions according to each trigger level. Once agreed, the protocol should be distributed to the police, health services, local government, emergency services and any other relevant organisations to ensure a consistency of response to future events.

TEMPORARY RELOCATION ADVICE

On 12 February 2014, the Chief Health Officer was aware that the Fire Services Commissioner considered that the mine fire would burn for at least one month.[218] In light of this information and given the indicative pollution figures provided by the EPA, the Board considers that the Chief Health Officer had sufficient information to issue the temporary relocation advice shortly after the weekend of 15 and 16 February 2014.

On the basis of the information provided, the Board considers that the Chief Health Officer's advice on 28 February 2014, that those in vulnerable groups living south of Commercial Road, Morwell should consider temporary relocation, was provided too late. While air quality did fluctuate during the fire, this does not justify taking a 'day-to-day'[219] approach to public health advice in connection with smoke from the fire that was predicted to burn for at least one month and was going to give rise to cumulative exposure to smoke over that month.

The basis for limiting temporary relocation advice to those in vulnerable groups living south of Commercial Road was poorly explained and was perceived by the community as arbitrary and divisive. The Board considers that the maps depicting $PM_{2.5}$ data collected by the EPA using the TravelBLANkET could easily have been published to explain this aspect of the advice to the community.

The Board accepts that there are risks associated with relocation, however it considers that people are best placed to make their own decisions about those risks. On the information provided, the Board does not consider that compulsory evacuation of the affected area was necessary.

The temporary relocation advice was announced on Friday 28 February 2014. Many residents did not receive the advice until the late afternoon or evening. The timing of the temporary relocation advice was not ideal and caused additional distress to some residents.

STATE SMOKE GUIDE

The Board supports the intention of the Victorian Government to undertake further development on the incorporation of the Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol documents into a single operational document.[220] The Victorian Government submitted to the Board that it also intends to develop a State Smoke Plan covering the management of potential public health impacts from large scale, extended smoke events such as bushfires, planned burns, brown coal mine fires or industrial (such as hazardous material) fires. The Victorian Government further submitted that the purpose of the State Smoke Plan should be to provide a framework for ensuring that the most accurate and relevant information available about air quality assessments and forecasts is provided to the Department of Health in the most efficient manner.

As part of the State Smoke Plan, the Victorian Government intends to review the existing Bushfire Smoke Protocol in preparation for the 2014/2015 summer bushfire season. The Victorian Government also intends to improve its ability to understand and predict the movement and impacts of smoke from planned burning and bushfires.[221] This will assist the Victorian Government to provide more accurate advice to the community.

The Board affirms this proposal, and recommends that the State Smoke Plan be incorporated into a State Smoke Guide, which would consist of a suite of documents and support materials that could be used to minimise the harmful effects of smoke in the community. The Guide should include the revised Bushfire Smoke Protocol, Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol. It should also include practical advice and support materials for employers, communities and individuals on how to minimise the harmful effects of smoke. The public information materials in the State Smoke Guide should be presented in plain language and answer the key questions likely to be posed by the community.

USE OF INDICATIVE AIR QUALITY DATA

The Public Health and Wellbeing Act provides that '(i)f a public health risk poses a serious threat, lack of full scientific certainty should not be used as a reason for postponing measures to prevent or control the public health risk.'[222]

A key concern for the Board was the reluctance of the Department of Health to utilise indicative data from the EPA to inform and guide the community response. In an emergency, it is expected that the Department would make all endeavours to obtain all information available and then utilise this to assess risks to the community.

The modelling provided by the EPA indicates that the highest readings of $PM_{2.5}$ and carbon monoxide were on the weekend of 15 February 2014 and 16 February 2014. As such, the Board considers that the Department of Health should have placed a greater reliance on the initial indicative data provided by the EPA.

The Board was also concerned by the lack of evidence provided to it about communication between the EPA and the Department of Health, specifically what air quality data was available and what data was required to inform public health advice. The evidence before the Board suggests that there was limited communication between the EPA and the Department about the utility and timeliness of air quality data, which may have inhibited the promptness of public health advice.

RELOCATION OF SCHOOLS AND CHILDREN'S SERVICES

The Board observed that there were two contrasting approaches to the relocation of schools and children's services in Morwell during the Hazelwood mine fire. The Latrobe City Council assessed the conditions and promptly relocated all children's services. The DEECD looked to the Chief Health Officer to provide direction about whether relocation was required.

Although the Commercial Road Primary School and the Sacred Heart Primary School were relocated relatively quickly, the Board is of the view that it would have been preferable to have the schools closed during the first week of the fire. The Board does not consider that it was necessary for DEECD to obtain direction from the Chief Health Officer before making a decision to relocate. The Board commends the Latrobe City Council for assessing the conditions in the southern part of Morwell, and independently and swiftly determining that the conditions were untenable for children and staff and not conducive to a quality education.[223]

ADVICE TO EMPLOYERS

The evidence before the Board demonstrated that there was a lack of clear and actionable information for employers to make sound judgments concerning air quality. The advice from VWA provided little assistance to the affected employers and business owners.

The Board considers that VWA, EPA and Department of Health should develop practical advice for employers, which reflects standards and trigger points for $PM_{2.5}$ and carbon monoxide. The advice should then be widely communicated and included in the State Smoke Guide.

LONG-TERM HEALTH STUDY

The toxic nature of smoke from the Hazelwood mine fire has raised community and epidemiological concerns that there will be ongoing physical and mental health implications. The Department of Health has agreed to fund a long-term and wide ranging health study. This is not a decision that would have been taken lightly–there are few examples in Australia of long-term studies linked to an environmental disaster.

The Board affirms the Department of Health's proposed long-term health study. The Board agrees a long-term study would be an extremely useful predictive tool to assist with understanding future risks, and to prevent or reduce the chances of adverse health effects arising from similar situations in the future. However, the Board recommends that all efforts be made to extend the duration of the study to at least 20 years given the long legacy of some potential pollutants and the fact that young children were susceptible to the impacts.

The Board agrees with the additional features of the study as suggested by Professor Campbell. In particular, in addition to the physical health effects from the exposure to the smoke and ash, the study should focus on the mental health impact of the Hazelwood mine fire; specifically the impact of the fire on levels of family violence and drug and alcohol abuse. The Board also agrees that the Department of Health should liaise closely with the EPA to ensure that air quality aspects are considered. An independent board, including community representatives, should govern the study, and regular reports should be made available to the public. The Health Advocate (see 'Matters for further consideration') should be a member of the independent board, monitor progress of the study, and be given access to the results as they become available.

Finally, the Board considers that it is important that as the study progresses, participants in the study and the local community are not only advised of the progress, but are provided with prompt, appropriate medical treatment as required.

The Board notes that studies are all very well, but they must be linked to sustained efforts to improve health outcomes for the region. To achieve this, a broader view must be taken of the scope and manner of the interventions needed to address health and social wellbeing. Action protocols should be developed to ensure that any findings from the study are quickly implemented to minimise the health consequences for both individuals and communities. In addition, action is required now to mitigate any future problems that may be found by the study. This is justified on the precautionary principle, which is well articulated in the Public Health and Wellbeing Act.

RECOMMENDATION 7

The State review and revise the community carbon monoxide response protocol and the firefighter carbon monoxide response protocol, to:

- ensure both protocols are consistent with each other;
- ensure both protocols include assessment methods and trigger points for specific responses;
- ensure GDF Suez and other appropriate essential industry providers are required to adopt and apply the firefighter carbon monoxide protocol; and
- inform all firefighters about the dangers of carbon monoxide poisoning, and in particular highlight the increased risks for those with health conditions and those who are pregnant.

RECOMMENDATION 8

The State review and revise the Bushfire Smoke Protocol and the $PM_{2.5}$ Health Protection Protocol, to:

- ensure both protocols are consistent with each other; and
- ensure both protocols include assessment methods and trigger points for specific responses.

RECOMMENDATION 9

The State develop and widely disseminate an integrated State Smoke Guide, to:

- incorporate the proposed State Smoke Plan for the management of public health impacts from large scale, extended smoke events;
- include updated Bushfire Smoke, carbon monoxide and $PM_{2.5}$ protocols; and
- provide practical advice and support materials to employers, communities and individuals on how to minimise the harmful effects of smoke.

RECOMMENDATION 10

The State should continue the long-term health study, and:

- extend the study to at least 20 years;
- appoint an independent board, which includes Latrobe Valley community representatives, to govern the study; and
- direct that the independent board publish regular progress reports.

RECOMMENDATION 17

GDF Suez adopt and apply the firefighter carbon monoxide response protocol.

MATTERS FOR FURTHER CONSIDERATION

HEALTH NEEDS OF THE LATROBE VALLEY

Although there are many excellent health services in the Latrobe Valley and activity levels were increased during the mine fire, there was not a coordinated whole of health sector approach. Many key players such as general practitioners, pharmacists and specialists were as much in the dark about what was happening as their patients and customers. For example, there was no evidence of effective advocacy or mediation at a population level from the health professions. Action was left to the initiative of the Department of Health, which although commendable in some areas, was by nature partial and had the drawback of being seen as a Melbourne-based response. The full power and potential of health services was not used and the community was the poorer for it in terms of communication, empathy, solidarity and timely action. Community members advised the Board that there was a lack of representation from the Department of Health at the first few community meetings and consultations.[224]

To date, the Department of Health has not outlined how it will help improve the health of the Latrobe Valley in the aftermath of the fire. In comparison, DHS has sought and has received funding to provide psychosocial support, which commenced during the fire and will continue at least into 2015.

The Board takes a much broader view of the recovery and prevention issues relating to health than that demonstrated to date by the Department of Health. The prevention agenda should not focus just on preventing a recurrence of another coal mine fire in the Latrobe Valley, but also the prevention of further threats to health, which may be exacerbated by any future fires. Similarly the recovery agenda goes beyond the immediate short-term issue to responding to potential medium and long-term effects that the health study may well find. Although we may hope for the best we also need to plan for the worst.

There is a strong case for the health of the population of the Latrobe Valley to be substantially improved. Based on current health status information, this was justified before the Hazelwood mine fire and is even more necessary after it. Specific improvements are needed, such as preventing and managing respiratory conditions. System-wide improvements are also needed, such as strengthening community capacity and resilience, tackling the social determinates of health, and providing hope and optimism for the community. There is a need to both conserve and then improve the health of the population. The Department of Health has recognised this in its prioritisation of Latrobe Valley as one of the sites for the Healthier Together program, which is a community-based health promotion initiative. This action is commended and needs to be built on.

HEALTH CONSERVATION ZONE

One way of providing a focal point for the coordination and integration of health services is to nominate the Latrobe Valley as a priority area for action across the health continuum. This has been undertaken in the UK and US, for example, by governments declaring geographical areas with high levels of health disadvantage as 'Health Improvement Zones', 'Health Enterprise Zones' or 'Health Action Zones' (Judge & Bauld, 2006, pp. 341-344).[225] The Victorian Government could consider such a designation for the Latrobe Valley utilising a new descriptor of 'Health Conservation Zone', which could also recognise environment dimensions. This would be a unique designation for the Latrobe Valley in a Victorian, Australian and global context.

The Victorian Government could require and encourage all relevant agencies and organisations to collaborate to protect and improve the health of the people of the Latrobe Valley. It is suggested that the Regional Office of the Victorian Department of Health could lead the development of an integrated 'Health Conservation Plan' for the Latrobe Valley. The Victorian Government could provide additional funding and other resources to enable this, together with legislative and regulatory measures where necessary.

The Health Conservation Plan for the Latrobe Valley could focus on the prevention and management of chronic diseases and the creation of supportive environments for health. A number of complementary elements are required including:

- health promotion/prevention (eg Healthy Together program)
- acute and subacute hospital care (public and private)
- rehabilitation, hospital in the home, aged care
- indigenous health, women and men's health, health of minorities
- mental health
- alcohol and drugs services
- general practice, community health services, community agencies
- tertiary universities, the regional medical school
- local government health services.

Other sectors including education, agriculture, industry and businesses could be expected to contribute to and support the 'Health Conservation Zone'. The Latrobe City Council could be charged with coordinating, assessing and publishing the health impacts of new policies and proposed new developments from these non-health sector organisations, within the framework of Victoria's exemplary Public Health and Wellbeing Act. There is an opportunity to develop models of health improvement that focus on providing evidence and measures of service integration.

LATROBE VALLEY HEALTH ADVOCATE

A noticeable feature of the Hazelwood mine fire was a lack of health leadership at the local level. The Board found no examples of health professionals who took on the role of enabler, mediator and advocate for the health of the community. Rather this was left to local community members or officers of Melbourne-based government agencies, who inevitably were at some disadvantage.

This was a significant deficiency, as many community members expressed a lack of trust in Melbourne-based government officials, based on prior experience over several decades.

The Board considers that the Latrobe Valley needs a local health voice that can win the trust of the community and be a sound source of advice, mediation and advocacy on health-related matters for the local community. An independent appointment is essential to engender the respect of the community. The appointee should be based in the local community and be separate from 'officers' of governmental departments.

In response and on a trial basis, the Victorian Government could consider the creation of a Health Advocate for the Latrobe Valley with core responsibilities for health monitoring, advocacy and facilitation of better health for the community. As part of the role, the Health Advocate could report annually on key issues affecting the health of the people of the Latrobe Valley.

The Health Advocate could also act as a champion for the Health Conservation Zone, and be actively engaged in the governance and follow up arrangements for the long-term health study.

There are historical and international precedents for such an appointment. For example, the first government sanctioned health advocate was the Medical Officer of Health for Liverpool in England. Dr William Henry Duncan was appointed in 1847 to champion improvements in the unsanitary conditions that were causing epidemics of cholera (Ashton, 1989, pp. 413-419). In Australia, the first Medical Officer of Health for Sydney, Dr William George Armstrong, was appointed in 1898.[226]

Later day examples internationally include positions such as Health Ombudsman, Health Broker, Health Navigator and Health Advocate. The Victorian Government has recently embraced the concept of an advocate for vulnerable groups, such as seniors, children, and people with disability. An extension of this concept focused on the health needs of a priority population, such as in the Latrobe Valley, is both logical and desirable.

Importantly, the proposed Health Advocate role would not replace, duplicate or compete with the responsibilities of the Chief Health Officer or the Health Services Commissioner. Rather, it provides a focal point at local level to 'champion' the health needs of the Latrobe Valley in terms of prevention, health services delivery, a supportive health promoting environment, and responsible industries.

Key competencies of the Health Advocate Latrobe Valley could be:

- leadership
- monitoring and assessing the health of the public
- policy, planning and program development
- communication, collaboration and partnering
- foundational clinical competencies
- professional practice.

Had a Health Advocate for the Latrobe Valley been in place at the time of the Hazelwood mine fire, the health and social impacts could have been much less. The Victorian Government's development of the concept of a Health Conservation Zone and a local Health Advocate could provide leadership both nationally and internationally.

HEALTH EXPERT ADVISORY MECHANISMS

In his statement to the Board, Mr Lapsley advised that he engaged an expert panel to peer review the fire extinguishment strategy.[227] Mr Lapsley told the Board that:

> … simply one of the most important things that I saw was the expert panel, a group of externals to come in and they were coaching and supporting what was done to make sure Incident Controllers in the mine, mine staff, were understanding what was a very complex environment of safety, the geotechnical parts, the water balance and how in which we used fire suppression activities.[228]

The Department of Health and EPA also utilised external sources to provide guidance during the Hazelwood mine fire. The Department of Health sought peer reviews of the Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol. The peer reviews (some of which were critical) were sought after the protocols were already in place and there is no evidence before the Board that the protocols were revised after receipt of the peer reviews.

The Chief Health Officer sought advice from the Environmental Health Standing Committee, a respiratory physician and a public health physician, prior to issuing her temporary relocation advice on 28 February 2014.

The Board is of the view that it was appropriate for the emergency services, Department of Health and EPA to seek assistance from external sources to assist in the management of the complex emergency. However, key differences in the approaches taken were the timing of the advice sought from external sources and the extent of the advice sought. Emergency services utilised external sources to assist in the decision-making process, whereas the evidence suggests that the Department of Health and EPA utilised external sources to provide advice after a decision had already been made.

The Board considers that in the event of a future health emergency, it would be beneficial for the Department of Health and in particular the Chief Health Officer to have the ability to seek support from sources external to the Department, before and throughout the event.

From 1 July 2014, the Emergency Management Commissioner is the responsible officer for all major emergencies that require health service and public health responses, unless otherwise specified in legislation. The Chief Health Officer will support the Emergency Management Commissioner in decision-making concerning major emergencies relating to public health. To assist with this process, the Department of Health and Emergency Management Victoria should consider establishing a standing Public Health Emergency Expert Panel or similar mechanism, which will offer advice on health/medical policies and protocols relevant to major public health emergencies.

The prior establishment of the Public Health Emergency Expert Panel or similar mechanism would be recognition that major public health emergencies are likely to be complex and fast moving, and that additional expertise may be required at short notice to complement that provided by the Department of Health and the Chief Health Officer. The utility of the Public Health Emergency Expert Panel or similar mechanism would be increased if it consisted of senior experts with competencies in key fields such as air and water pollution, infectious diseases and hazardous materials, and include experts drawn from Victoria, nationally and internationally as required.

1. Written submission of the Victorian Government, 22 May 2014, para. 10.2
2. Exhibit 44 – Statement of Christopher Brook, para. 25
3. Exhibit 44 – Statement of Christopher Brook, para. 23; Written submission of the Victorian Government, 22 May 2014, para. 10.4
4. Adapted from Exhibit 44 – Statement of Christopher Brook, para. 26
5. Exhibit 46 – Statement of Rosemary Lester, para. 4
6. *Public Health and Wellbeing Act 2008 (Vic),* s. 5
7. *Public Health and Wellbeing Act 2008 (Vic)*, s. 6
8. *Public Health and Wellbeing Act 2008 (Vic)*, s. 9
9. Lester T1156:1-5
10. Exhibit 46 – Statement of Rosemary Lester, para. 11
11. Exhibit 46 – Statement of Rosemary Lester, para. 11
12. Exhibit 46 – Statement of Rosemary Lester, para. 11; Exhibit 44 – Statement of Christopher Brook, para. 27
13. Exhibit 44 – Statement of Christopher Brook, para. 40
14. Exhibit 44 – Statement of Christopher Brook, paras 38 & 39
15. Exhibit 46 – Statement of Rosemary Lester, para. 11
16. Exhibit 46 – Statement of Rosemary Lester, para. 71
17. Lester T1205:9-14
18. Wheatland T1262:15-28
19. Written submission of Brenda Maguire
20. Lester T1168:3-15
21. Exhibit 46 – Statement of Rosemary Lester, para. 75
22. Exhibit 46 – Statement of Rosemary Lester, attachment 18
23. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.002.0003; DOH.00001.002.0007)
24. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
25. Community consultation, Latrobe Performing Arts Centre, Traralgon, 16 April 2014, 11 am
26. Exhibit 46 – Statement of Rosemary Lester, para. 19
27. Exhibit 46 – Statement of Rosemary Lester, para. 20
28. Lester T1125:9-16
29. Exhibit 46 – Statement of Rosemary Lester, paras 21-23
30. Lester T1127:31 – T1128:3
31. Lester T1126:23 – T1127:12
32. Adapted from Exhibit 46 – Statement of Rosemary Lester, attachment 5, p.10
33. Adapted from Exhibit 46 – Statement of Rosemary Lester, attachment 5, p.10
34. Exhibit 32 – Statement of John Merritt, para. 103
35. Exhibit 32 – Statement of John Merritt, appendix 4
36. Exhibit 44 – Statement of Christopher Brook, para. 52
37. Written submission of the Victorian Government, 22 May 2014, para. 10.123
38. Lester T1213:12-13
39. Lester T1213:2-18
40. Written submission of the Victorian Government, 22 May 2014, para. 10.130
41. Wilson T1939:28 – T194019
42. Exhibit 44 – Statement of Christopher Brook, paras 49-56
43. Exhibit 44 – Statement of Christopher Brook, para. 79(d)
44. Campbell T1244:4-21
45. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.001.0011; DOH.0001.001.0009; DOH.0001.001.0007)
46. Exhibit 44 – Statement of Christopher Brook, paras 53 & 54
47. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.001.0005)
48. Roundtable with Latrobe Valley General Practitioners, 20 Hazelwood Road, Morwell, 7 May 2014
49. Roundtable with Latrobe Valley General Practitioners, 20 Hazelwood Road, Morwell, 7 May 2014
50. Campbell T1244:22-25; T1240:31 – T1241:16
51. Exhibit 46 – Statement of Rosemary Lester, para. 51
52. Exhibit 46 – Statement of Rosemary Lester, para. 52
53. Exhibit 38 – Second statement of Paul Torre, paras 23, 26 & 30
54. Katsikis T539:2-22
55. Exhibit 21 – Statement of Costa Katsikis, paras 20 & 21
56. Exhibit 24 – Statement of Brooke Burke, para. 22
57. Exhibit 1 – Statement of Craig Lapsley, para. 162
58. Exhibit 1 – Statement of Craig Lapsley, para. 162
59. Lester T1152:4-24

60. Lester T1152:25-31 (Response provided 2 July 2014)
61. Lester T1152:13-24
62. Lester T1154:10-13
63. Exhibit 18 – Statement of Simon Bloink, para.19
64. Exhibit 18 – Statement of Simon Bloink, para. 19; Exhibit 24 – Statement of Brooke Burke, para. 26
65. Exhibit 21 – Statement of Costa Katsikis, paras 25 & 26
66. Exhibit 21 – Statement of Costa Katsikis, para. 27
67. Exhibit 21 – Statement of Costa Katsikis, paras 28 & 29
68. Lester T1156:6-16
69. Torre T982:3 – T983:8
70. Exhibit 47 – Email from Vikki Lynch dated 16 February 2014
71. Lester T1160:26 – T1161:25
72. Torre T1017:26 – T1018:15
73. Exhibit 46 – Statement of Rosemary Lester, paras 55 & 56; Lester T1154:16-23
74. Lester T1155:7-16
75. Exhibit 40 – Expert report of Claire Richardson, page 9 (Table 1a)
76. Lester T1158:14-20
77. Written submission of the Department of Health, 23 June 2014, p. 2
78. Exhibit 46 – Statement of Rosemary Lester, attachment 8, p. 2
79. Exhibit 46 – Statement of Rosemary Lester, attachment 8, p. 2
80. Exhibit 46 – Statement of Rosemary Lester, attachment 8, pp. 4-6
81. Adapted from Exhibit 46 – Statement of Rosemary Lester, attachment 8, p. 3
82. Third written submission of the Victorian Government, paras 59 & 63
83. Exhibit 46 – Statement of Rosemary Lester, para. 58
84. Exhibit 46 – Statement of Rosemary Lester, attachment 9, p.7
85. Exhibit 32 – Statement of John Merritt, appendix 3 (EPA.0001.007.0001; EPA.0001.007.0005)
86. Exhibit 32 – Statement of John Merritt, appendix 3 (EPA.0001.007.0005)
87. Exhibit 32 – Statement of John Merritt, appendix 3 (EPA.0007.007.0005)
88. Campbell T1246:2 – T1247:11
89. Lester T1187:4-15
90. Merritt T847:26-28
91. Torre T990:22-24
92. Third written submission of the Victorian Government, 23 June 2014, para. 56
93. Exhibit 56 – Statement of Alan Hall, para. 131
94. Written submission of the Victorian Government, 22 May 2014, para. 10.22
95. Exhibit 56 – Statement of Alan Hall, para. 131
96. Community consultation, Morwell Bowling Club, 16 April 2014, 7 am
97. Community consultation, Federation University Auditorium, Churchill, 11 April 2014, 1.30 pm; Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
98. Exhibit 44 – Statement of Christopher Brook, paras 63 & 64
99. Brook T1086:2-29
100. Exhibit 44 – Statement of Christopher Brook, paras 65-67
101. Exhibit 44 – Statement of Christopher Brook, para. 68
102. Exhibit 46 – Statement of Rosemary Lester, para. 70
103. Adapted from Exhibit 46 – Statement of Rosemary Lester, attachment 16, p. 10
104. Community consultation, Kernot Hall, Morwell, 15 April 2014, 7 pm
105. Written submission of the Victorian Council of Social Service, p. 16
106. Written submission of Julia Browell
107. Exhibit 71 – Statement of Robert Jackman, para. 22
108. Roundtable with Latrobe Valley General Practitioners, 20 Hazelwood Road, Morwell, 7 May 2014
109. Exhibit 44 – Statement of Christopher Brook, para. 84
110. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0001.002.0019)
111. Written submission of Antony John
112. Tabain T1423:2-27
113. Exhibit 56 – Statement of Alan Hall, para. 134
114. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0005.0003.0010)
115. Exhibit 46 – Statement of Rosemary Lester, attachment 18 (DOH.0005.0003.0010)
116. Community consultation, Morwell Club, 8 May 2014, 7 am
117. Lund T768:1-25

118. Exhibit 55 – Statement of John Mitchell, para. 115
119. Lester T1144:31 – T1145:20
120. Adapted from Exhibit 85 – Material provided by the EPA, Hazelwood coal mine fire - air quality monitoring report (draft)
121. Exhibit 46 – Statement of Rosemary Lester, para. 65
122. Exhibit 47 – Email from Vikki Lynch dated 16 February 2014
123. Adapted from Exhibit 46 – Statement of Rosemary Lester, para. 65
124. Exhibit 46 – Statement of Rosemary Lester, attachment 14
125. Exhibit 46 – Statement of Rosemary Lester, para. 63
126. Exhibit 46 – Statement of Rosemary Lester, para. 63
127. Adapted from Exhibit 46 – Statement of Rosemary Lester, attachment 11, pp. 5 & 6
128. Lester T1172:23-25
129. Exhibit 46 – Statement of Rosemary Lester, attachment 11
130. Adapted from Exhibit 46 – Statement of Rosemary Lester, attachment 11
131. Exhibit 46 – Statement of Rosemary Lester, attachment 12
132. Exhibit 46 – Statement of Rosemary Lester, attachment 12, para. 2.1.3
133. Exhibit 46 – Statement of Rosemary Lester, attachment 12, para. 2.1.3
134. Richardson T1033:23-27
135. Exhibit 46 – Statement of Rosemary Lester, attachment 13
136. Exhibit 46 – Statement of Rosemary Lester, attachment 13
137. Exhibit 46 – Statement of Rosemary Lester, attachment 13
138. Exhibit 46 – Statement of Rosemary Lester, attachment 13
139. Exhibit 46 – Statement of Rosemary Lester, attachment 13
140. Torre T991:27-31
141. Exhibit 46 – Statement of Rosemary Lester, para. 84
142. Exhibit 46 – Statement of Rosemary Lester, para. 85
143. Exhibit 46 – Statement of Rosemary Lester, para. 86
144. Exhibit 45 – Statement of Rosemary Lester, attachment 13
145. Mitchell T1434:9-21
146. Mitchell T1434:25 – T1435:8
147. Mitchell T1435:18-24
148. Victorian Government Documents, 22 May 2014, Explanation of travel blanket results of sampling on 22nd February (EPA.0010.004.0332)
149. Exhibit 46 – Statement of Rosemary Lester, para. 87
150. Lester T1175:11-25
151. Lester T1175:11 – T1176:5
152. Lester T1176:6-12
153. Lester T1176:21-29
154. Wilson T1947:7-27
155. Lester T1173:31 – T1174:22
156. Written submission of Julie Brown
157. Wheatland T1262:31 – T1263:12
158. Wheatland T1261:20-21
159. Campbell T1234:15 – T1235:7
160. Campbell T1234:26-31
161. Written submission of Fred Burn
162. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
163. Mitchell T1428:21-30
164. Exhibit 55 – Statement of John Mitchell, paras 17 & 18
165. Mitchell T1429:6-11
166. Mitchell T1430:7-24
167. Mitchell T1431:10-22
168. Mitchell T1431:23 – T1432:4
169. Exhibit 55 – Statement of John Mitchell, paras 22-24
170. Mitchell T1432:28 – T1433:7
171. Exhibit 55 – Statement of John Mitchell, para. 36
172. Exhibit 36 – Statement of Nicholas Pole, paras 12 & 13
173. Exhibit 36 – Statement of Nicholas Pole, para. 14
174. Exhibit 36 – Statement of Nicholas Pole, para. 49
175. Pole T907:19-22
176. Exhibit 36 – Statement of Nicholas Pole, para. 82

177. Pole T904:1-8; T908:2-7
178. Pole T904:18-23
179. Pole T904:29 – T905:14
180. Pole T906:3-14
181. Exhibit 36 – Statement of Nicholas Pole, para. 86
182. Exhibit 98 – letter from VGSO dated 13 June 2014; Exhibit 36 – Statement of Nicholas Pole, para. 87
183. Exhibit 36 – Statement of Nicholas Pole, attachment 45
184. Pole T911:31 – T912:4
185. Exhibit 36 – Statement of Nicholas Pole, para. 51
186. Exhibit 36 – Statement of Nicholas Pole, para. 97
187. Pole T924:26 – T930:2
188. Exhibit 98 – Letter from VGSO dated 13 June 2014
189. Exhibit 36 – Statement of Nicholas Pole, attachment 46
190. Pole T927:28 – T928:4
191. Exhibit 36 – Statement of Nicholas Pole, para. 53
192. Exhibit 36 – Statement of Nicholas Pole, paras 52 & 53
193. Exhibit 36 – Statement of Nicholas Pole, para. 60
194. Pole T920:24 – T921:2
195. Exhibit 36 – Statement of Nicholas Pole, attachment 16
196. Exhibit 36 – Statement of Nicholas Pole, para. 59
197. Exhibit 70 – Statement of Leonard Neist, attachment 2
198. Neist T1852:11-18
199. Neist T1852:24 – T1853:14
200. Exhibit 70 – Statement of Leonard Neist, para. 42
201. Wheatland T1254:17-28
202. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
203. Wheatland T1255:9-25
204. Mitchell T1438:21-30
205. Mitchell T1441:16-25
206. Burke T1371:11-20
207. Exhibit 54 – Statement of Brooke Burke, para. 14
208. Exhibit 46 – Statement of Rosemary Lester, para. 92
209. Exhibit 46 – Statement of Rosemary Lester, para. 93
210. Brook T1113:6-13
211. Lester T1191:3-13
212. Exhibit 48 – Expert report of Donald Campbell, paras 104-115
213. Campbell T1239:22 – T1240:2
214. Second written submission of the Victorian Government, 18 June 2014, paras 7.4 & 7.6
215. Exhibit 47 – Email from Vikki Lynch dated 16 February 2014; Lester T1160:7-15; T1219:11-17
216. Lester T1187:11-15
217. Written submission of GDF Suez, 18 June 2014, p. 97
218. Lester T1144:8-10
219. Lester T1146:20-24
220. Second written submission of the Victorian Government, 18 June 2014, para. 6.17
221. Second written submission of the Victorian Government, 18 June 2014, paras 7.4-7.7
222. *Public Health and Well Being Act 2008* (Vic), s. 6
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224. Community consultation, Morwell Bowling Club, 16 April 2014, 7 am
225. Department of Health 1999, *Health Action Zones: Learnings to Make a Difference*, viewed 28 July 2014, www.pssru.ac.uk/pdf/dp1546.pdf; Department of Health and Mental Hygiene, DHMH Baltimore, viewed 28 July 2014, www.dhmh.maryland.gov/healthenterprisezones/SitePages/Home.aspx
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4.7 RELIEF AND RECOVERY

OVERVIEW

This Chapter describes the relief and recovery measures (except those relating to personal health), which government agencies and GDF Suez took to support the Latrobe Valley community during and after the Hazelwood mine fire.

The Board of Inquiry's Terms of Reference direct the Board to consider and report on the response to the mine fire. Relief and recovery measures are part of this response.

Relief and recovery during the Hazelwood mine fire was primarily provided by the Department of Human Services and the Latrobe City Council. The Department of Human Services facilitated relief payments to residents who sought respite or relocation from the affected area. The Department, together with the Latrobe City Council facilitated a clean up program, which aimed to assist residents to clean their homes of smoke and ash residue caused by the mine fire. Financial assistance was also available to affected businesses and the community.

The Board heard from representatives from the Department of Human Services, the Latrobe City Council and the community. At community consultations and in written submissions, members of the community commented on the relief and recovery assistance offered. They criticised the timing and adequacy of the clean up packages and questioned the basis for eligibility for relief and recovery payments. In contrast, members of the business community informed the Board that a range of recovery efforts was assisting them to get back on their feet.

The Board also heard from the Latrobe City Council about the governance arrangements relevant to recovery planning and delivery and the initiatives taken by the Council, including clean up packages.

The Board commends the Victorian Government for providing financial and other support for small business through the Morwell Business Relief Fund. The Board commends GDF Suez for its 'Revive Morwell' initiative and grants to the community through its Community Social Responsibility Committee. The Board recognises that relief payments were tailored to assist residents affected by the mine fine, however it heard that there was confusion about eligibility requirements, which caused distress to the community.

Based on information before the Board, it is apparent that the Latrobe City Council worked strenuously to implement relief and recovery measures, and to advocate on behalf of the community for adequate clean up packages. While acknowledging that the Victorian Government has not previously provided clean up assistance after natural disasters, the Board heard that the self clean package did not meet the needs of the affected community and that delivery of the assisted clean up package was significantly delayed.

RESPONSE, RELIEF AND RECOVERY

The 'response' to an emergency refers to action taken to minimise the consequences of the event. These actions might include firefighting, rescue and evacuation. Emergency 'relief' refers to the provision of essential needs to individuals and families in the immediate aftermath of the event. 'Recovery' after an emergency describes measures taken to assist people and communities affected by the emergency to achieve a proper and effective level of functioning.[1]

Typically, relief and recovery follow on sequentially from the response phase of an emergency.

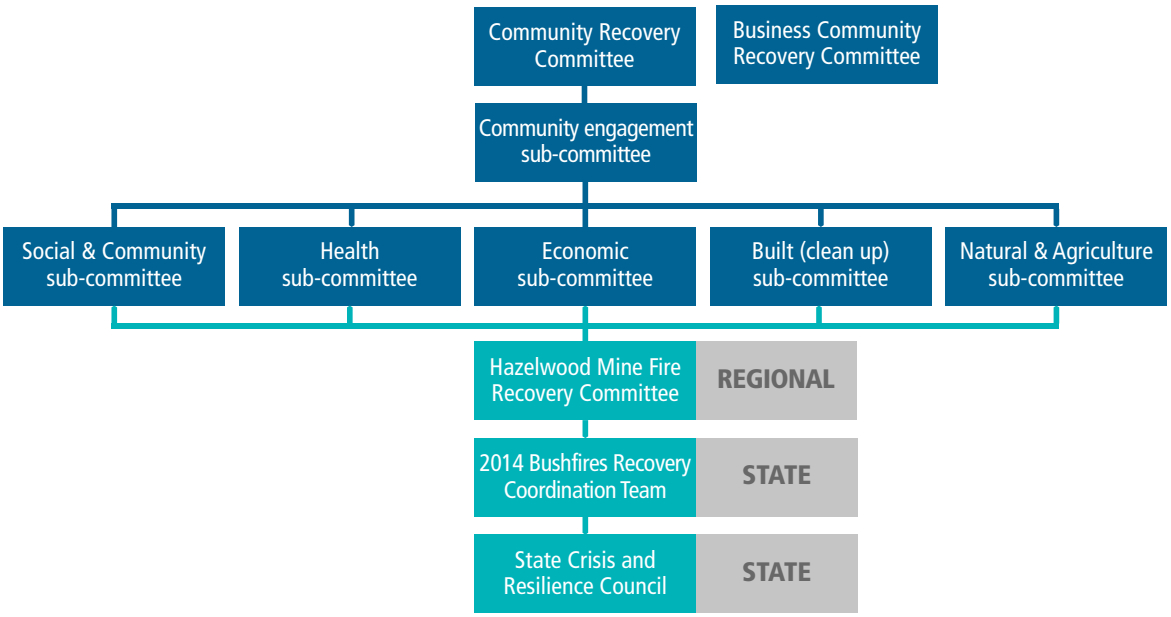
GOVERNANCE

COORDINATION STRUCTURE

The State Emergency Relief and Recovery Plan, established under the *Emergency Management Act 1986* (Vic), (Emergency Management Act), provides for local, regional and state emergency recovery activities to operate concurrently at multiple levels.[2]

The State recovery coordination structure for the Hazelwood mine fire is set out in Figure 4.61.

Figure 4.61 The State recovery coordination structure during the Hazelwood mine fire[3]



The State Crisis and Resilience Council is the peak body for advising government on state emergency management policy and strategy. The Council was established in April 2013 under the *Emergency Management Act 2013* (Vic). Membership is made up of heads of government departments and key agencies, such as Victoria Police.

DEPARTMENT OF HUMAN SERVICES

In accordance with the Emergency Management Act, the Emergency Management Manual Victoria provides that the Department of Human Services (DHS) is the principal agency for relief and recovery coordination in Victoria at a state and regional level. In an emergency, DHS delivers social recovery support, including information, financial support, personal and psychosocial support, and temporary accommodation.[4]

DHS also operates a shared service with the Department of Health, called Health and Human Services Emergency Management, which plans and delivers relief and recovery functions.[5]

The State Recovery Coordinator is the individual responsible within DHS for coordinating recovery activities across Victoria.[6]

DHS RESPONSE TO THE HAZELWOOD MINE FIRE

On 14 January 2014, Health and Human Services Emergency Management activated the Health and Human Services State Emergency Management Centre. The Centre was established in response to bushfires across Victoria, and coordinated the DHS response to the Hazelwood mine fire. During the mine fire, Health and Human Services Emergency Management issued daily situation reports to a variety of community service organisations.[7]

DHS also produced a weekly relief action plan for the Latrobe Valley area, which detailed the current situation, the status of relief and recovery services, and the weekly actions and objectives of designated responsible parties.[8]

DHS assisted the Department of Health to coordinate a number of respite measures. This is discussed further in Chapter 4.6 Health response.

LATROBE CITY COUNCIL

Latrobe City Council stated to the Board that elements of relief and recovery were being planned and delivered at the same time during the Hazelwood mine fire. That is, the community was simultaneously provided with resources to minimise the effect of the mine fire and resources to assist the community to return to a pre-mine fire level of functioning.

The Latrobe City Council retained responsibility for coordinating recovery operations, however given the duration and scale of the fire and its impacts, DHS supported the Council in this function.[9] According to Council, this led to some community confusion about their different roles and responsibilities.[10]

Mr John Mitchell, Acting Chief Executive Officer of the Latrobe City Council, told the Board that 'this time was the first time that in the recovery phase we had a dual control in terms of DHS and the Council,'[11] and that as a result, there were more relationship and coordination issues involved.[12]

Mr Alan Hall, State Recovery Coordinator, told the Board that 'it remains the Council's responsibility under the Emergency Management legislation to manage recovery at a municipal level'.[13]

OTHER ORGANISATIONS

Other local, regional and state-based organisations worked closely with government to assist with community relief and recovery relevant to the Hazelwood mine fire. These organisations included the Red Cross, the Victorian Council of Churches, the Salvation Army, and the Insurance Council of Australia (ICA).

RELIEF

A number of the relief activities undertaken in relation to the Hazelwood mine fire have been discussed in Chapter 4.6 Health response.

The State Relief Readiness Plan (previously called the State Relief Plan) was amended in February 2014 to address relief requirements relevant to the mine fire.[14] The Plan provides a framework to enable planning, management and coordination of emergency relief and recovery activities.

At the regional level, the Regional Recovery Coordinator formally approved the Gippsland Regional Relief (Latrobe Valley Coal Mine Fire Incident) Plan on 28 February 2014. The Plan outlined Gippsland's regional level relief coordination and management, and detailed lead agencies for relief functions such as planning food and water provision, and emergency shelter. It detailed procedures in the case that an evacuation was triggered.[15]

RELIEF PAYMENTS

DHS administers the Victorian Government's Personal Hardship Assistance Program, which includes two categories of assistance:

- emergency relief assistance (to meet immediate relief needs)
- emergency re-establishment assistance (to assist in the re-establishment of a principal place of residence).

The Personal Hardship Assistance Program provides financial assistance to alleviate the personal hardship and distress suffered by eligible Victorians as a result of an emergency. This assistance is not intended to replace insurance or other compensation for loss.[16]

Emergency relief assistance is available to eligible applicants in the first seven days after a designated emergency event (primarily natural emergencies), for example fire, flood or tsunami.[17] As the Hazelwood mine fire was started by a bushfire, the Personal Hardship Assistance Program was applicable.[18] DHS activated the emergency relief and assistance program to assist those impacted by the Hazelwood mine fire.

RESPITE PAYMENTS

DHS recognised that some Morwell residents experienced personal hardship as they tried to seek respite from smoke and ash.[19] Consequently, DHS made a respite payment available to eligible community members.[20]

The respite payments were made available from 21 February 2014. The payments comprised of $500 per household, or $1,250 per household in exceptional circumstances.[21]

The respite payments were available to families who met the following criteria:

- hardship experienced by the smoke related to the fire
- a primary place of residence as a Morwell address
- low income, for example pension or benefit
- intention to relocate from Morwell for the purpose of respite.[22]

Additional factors applicable to eligibility for the higher payment included:

- the size of the household's membership
- where a family or household would relocate for respite purposes
- mode of travel
- accommodation type, for example whether the applicant would stay with family or in paid accommodation.[23]

A second respite payment of $500 was made available to eligible Morwell residents on 7 March 2014.[24]

RELOCATION PAYMENTS

After Dr Rosemary Lester, Chief Health Officer, issued an advice on 28 February 2014 that vulnerable residents living south of Commercial Road in Morwell should relocate, DHS announced a relocation payment to assist those residents.[25]

Temporary relocation payments of up to $1,250 (or $750 for single person households) per week were available to eligible households.[26] Eligibility criteria included:

- hardship experienced by the smoke related to the fire
- a primary place of residence within the affected area
- low-income, for example pension or benefit
- need to relocate because of assessed vulnerability.[27]

In his statement to the Board, Mr Hall outlined that the relocation payments differed from the usual payments made under the Victorian Government's Personal Hardship Assistance Program. These differences reflected the unique nature of the Hazelwood mine fire event and ensured assistance was targeted to the 'at risk' groups that Dr Lester had recommended relocate.[28]

Mr Hall told the Board:

> …our instructions to staff were to take a liberal approach…to that definition and to use their judgment about the circumstances of individuals living in the proximity…of that boundary of Commercial Road and to take a generous approach, if you like, to how they assess claims for people.[29]

Approximately 65 per cent of all Morwell households received at least one financial assistance payment for respite or relocation purposes during the Hazelwood mine fire.[30]

COMMUNITY RESPONSE TO RESPITE AND RELOCATION PAYMENTS

During community consultations the Board was told that the 'red tape' around relocation and respite assistance meant that not all offers of assistance to the community were taken up. There was also community concern that the respite payment came too late and was not available to everyone.[31]

Ms Kylie Stockdale of Morwell submitted to the Board that her family had difficulty obtaining the relocation payment after they relocated to Perth: 'There was a breakdown in communication between Department of Health and Department of Human Services. Each organisation was giving out different advice, and DHS employees on the phone were not aware of information provided by DoH [Department of Health].'[32] Ms Stockdale also pointed out that the DHS office was located in the area south of Commercial Road, which was subject to the relocation advice.[33]

The Board heard that some members of the community were concerned about misuse of the respite and relocation payments. In her submission to the Board, Ms Rosemary Wigg of Morwell stated: 'it was bad enough that $3 million was spent on relocation costs, only to have much of it wasted on people claiming it and not actually leaving.'[34] She submitted that a few checks and balances on the government's part should have been all that was required to prevent abuse of the respite payments.[35] The Board also received a submission from Ms Maria Marino of Morwell who said that some people who claimed the assistance did not relocate but rather used the funds to purchase alcohol, televisions, and other items.[36]

The community also expressed confusion about who was eligible for the payments. Ms Tracie Lund, Morwell Neighbourhood House Coordinator, told the Board:

> I didn't actually understand who qualified for the assistance packages and who didn't based on the information I was reading. So every person that we had spoken to, we just ended up giving them the, I think it was the 1800 or 1300 number at the time because we weren't clear ourselves on who was going to qualify and who wasn't. I believe that the community was very confused about this as well.[37]

The Board heard that there was a perception in the community that an individual was only entitled to the respite payment if they had a healthcare card. Mr Hall conceded that there was initial confusion about the eligibility criteria for the respite payment and the requirement for proof of low income.[38]

Ms Jennifer Barfoot of Morwell outlined in her submission to the Board that when she sought assistance from DHS, she was told that she was not eligible because she was not a pensioner or healthcare cardholder. She said that the lack of equity in administering payments divided the community and made a terrible situation even more stressful. She wrote:

> Despite having a long history of admissions with asthma and I had a number of medical professionals who were more than happy to supply documentation to support this fact I was unable to obtain **any** assistance from the agencies who were advertised as supporting the public. As someone who did not have a health care card or was on a pension I was stunned at the discrimination I was given despite living 350 metres from the fire where the smoke was engulfing my home of 28 years for more than a month. Other members of the public were offered relocation assistance and a host of other benefits – I had to soldier on sleeping in the masks provided and putting up with the smoke or the expense of leaving town daily in my car equipped with my portable nebulizer.[39]

Mr Ray Whittaker of Morwell was concerned about the manner in which the payments were provided. He stated to the Board that he was made to feel guilty about receiving the payment and that there appeared to be an inequity about the distribution of the payments, as he received the payment but his disabled son was not eligible.[40] Similar concerns were repeated at a number of the community consultations.

Ms Karen Andrew, Youth Suicide Prevention Counsellor at Ramahyuck District Aboriginal Corporation and a member of the local indigenous community, outlined in her statement to the Board that she did not consider that the majority of the indigenous community made use of the assistance available to them.[41]

The timing of the relocation payment also raised concerns for the community. Ms Vicki Hamilton, Chief Executive Officer and Secretary of Asbestos Council of Victoria and Gippsland Asbestos Related Diseases Support, Inc., submitted that the announcement of the relocation on Friday afternoon meant that no one could apply for assistance until the following Monday, which left residents anxious all weekend.[42]

Mr Hall told the Board that payments were restricted to one per household. He also told the Board that DHS was open during the weekend of 1 and 2 March 2014, after the announcement of the relocation package, and that the telephone hotline was available all weekend and extended to late on Friday night. Mr Hall was unable to explain why some community members thought that they had to wait until Monday to apply for the relocation payments.[43]

The Victorian Government informed the Board that it intends to implement new technology for recording DHS emergency assistance payments.[44]

RECOVERY

The State Recovery Plan 2014 Bushfires was updated on 25 March 2014 to include all state recovery coordination activities associated with the Hazelwood mine fire.[45] The Plan sets out a multi agency strategic approach to management and implementation of recovery activities after the 2014 bushfires.

Mr Hall informed the Board that from early March 2014 the Hazelwood Mine Fire Recovery Committee, chaired by DHS, coordinated recovery at the regional level. The Committee comprised representatives from the Latrobe City Council, the Department of Health, the Department of Education and Early Childhood Development, the Department of Environment and Primary Industries (DEPI), the Department of Transport, Planning and Local Infrastructure (DTPLI), the Department of State Development and Business Innovation (DSDBI), the Environment Protection Authority (EPA), the Country Fire Authority (CFA) and the Regional Incident Controller.[46]

On 7 March 2014, DHS developed a Hazelwood Mine Fire Recovery Transition Plan, which was approved by the Regional Coordinator, and then distributed to the Latrobe City Council and various state departments.[47] The Plan outlines the arrangements for planning relevant to delivery of emergency recovery activities in the lead up to formal transition to recovery.

On the same day, DHS and Latrobe City Council developed the Hazelwood Mine Fire Recovery Plan.[48] The plan sets out the arrangements for coordinating and managing the planning and delivery of emergency recovery activities across the affected region. It also articulates the goal and objectives of recovery, governance, reporting and communication arrangements for six recovery streams. Responsibility for each of the six recovery streams is outlined in Figure 4.62.

Figure 4.62 Lead agency for streams of recovery[49]

Recovery stream	Lead agency/chair
Social and community	DHS
Health	Department of Health
Economic	DSDBI
Built environment	Local Government Victoria
Natural and agricultural environment	DEPI
Community engagement	DHS and Latrobe City Council

Under the Hazelwood Mine Fire Recovery Plan's regional governance structure, a Community Recovery Committee and a Morwell Business Committee have been established. Both Committees have community membership.

RECOVERY INFORMATION

In his statement to the Board, Mr Hall outlined that on 10 March 2014, the Public Information Unit attached to the State Emergency Management Centre drafted a Recovery Community Engagement and Communications Plan. The Plan was based on strategies successfully used to guide recovery communications during previous events, and was designed to help direct appropriate communications and engagement activities as time and resources allowed.[50]

Mr Hall further explained that the Emergency Relief and Recovery Victoria website was updated daily and that the Victorian Emergency Recovery Information Line also provided information to the community. Details of the information provided through the recovery line were not provided to the Board.[51]

Specific information on recovery for the community was available in Morwell from 21 February 2014, through an information centre established by DHS and supported by the Latrobe City Council.

On 28 February 2014, the Latrobe City Council, in partnership with DHS, opened a Community Information and Recovery Centre in Morwell. The purpose of the centre was to be a one-stop shop for information, cleaning assistance and other support.[52]

Communications included 14 issues of a fortnightly recovery newsletter titled 'Unite and Recover' issued by the Council, and a twice weekly newsletter which was letter box dropped to all Morwell properties, with hard copies also distributed at community venues such as Morwell Neighbourhood House, Morwell railway station and aboard V/Line trains.[53]

CLEAN UP

Residents, businesses and not-for-profit organisations in Morwell and surrounding districts had to contend with smoke and ash, which settled on exterior and interior walls and surfaces, soft furnishings, carpet and clothing, in roof and wall cavities, and on vehicles and pathways. Ms Lisa Wilson, Gippsland Homeless Network Coordinator at Quantum, told the Board: 'A layer of dirt had settled on everything in the house and it was extremely hard to lift. Outside a layer of black scum covered everything, not just the flat surfaces but the walls of the house as well'.[54]

A joint committee comprised of Local Government Victoria staff and Latrobe City Council officers commenced clean up planning. This committee consulted the community, talked to private contractors and submitted its plans to the State Crisis and Resilience Committee.[55]

On 28 February 2014, a further team was set up to explore options for a town clean up. DTPLI was responsible for coordinating the initial planning and development of options; Local Government Victoria was responsible for coordinating the implementation of a clean up plan in collaboration with Latrobe City Council; and the Latrobe City Council was responsible for local operational delivery.[56]

Prior to finalising and implementing the Morwell Clean-up Plan, Latrobe City Council engaged a number of local contractors to clean the Morwell central business district and the southern area of Morwell. This included high-pressure cleaning of paths, driveways and buildings, as well as cleaning windows and street furniture to remove dust, ash and debris from the smoke.[57]

On 10 March 2014, coordination of clean up at state level transitioned back to DHS, under state emergency management arrangements.[58]

On 18 March 2014, the Victorian Government announced a $2 million community assistance package to help with the clean up.[59] The package offered professional cleaning of the homes of Home and Community Care residents, people assessed as having high needs because of their age, a disability or current health condition, and those who received a relocation grant through DHS.[60] All residents were entitled to a clean up kit that included a bucket, gloves, hose nozzle, dust mask, information about how to clean effectively, and a laundry and car wash voucher to use at local businesses.[61]

According to DHS, as at 12 May 2014, 780 assisted clean ups were completed by professional cleaning services, 635 self cleanup kits and 713 laundry vouchers were distributed, 1,143 car wash vouchers were issued, and there were 418 loans of HEPA filter vacuum cleaners. Mr Hall anticipated that all assisted clean ups would be completed by the end of May 2014.[62]

In addition, DEECD arranged for comprehensive cleaning of Commercial Road Primary School, several learning centres, two Catholic schools and one non-government school, before the beginning of Term 2.[63] Mr Robert Jackman, Morwell resident, informed the Board that 'Sacred Heart Primary School was cleaned up by a professional cleaner over the school holidays. They did an amazing job cleaning the playground, the classrooms, computers and library books.'[64]

Mr Mitchell told the Board that the Latrobe City Council initially proposed that those who completed a self clean would be provided with vouchers to the value of $150 to obtain cleaning products of their choice, and that those eligible for an assisted clean up would get $750 worth of cleaning services per household, which included cleaning of roof cavities.[65] Mr Mitchell detailed how the State Crisis and Resilience Committee scaled back the proposal and how the Council sought to obtain adequate resources by taking Local Government Victoria officers to visit a sample of properties.[66] Mr Mitchell said that decisions about the scope of the clean up packages, the contents of the kits, and eligibility criteria, were determined by

the Victorian Government.[67] He also noted that the Council was instructed not to commence any work towards implementation of the clean up process, including taking steps to advertise for cleaning services or obtain quotes, until details of the clean up package were formally announced. This resulted in a three week delay between the announcement and the availability of clean up assistance to residents.[68]

The Council understood that the community's expectations around clean up were not met:

> Council is of the opinion that the reduced funding scope for the residential clean up, tasked to the Latrobe City Council for delivery has in many cases not met the needs and expectations of the community. Latrobe City Council has consistently received negative feedback from the community regarding the equipment provided… Limiting those who qualified for an assisted clean, along with delays in cleaning the homes of those who did qualify resulted in increased frustration and anger from some community members towards Council.[69]

COMMUNITY RESPONSE TO CLEAN UP

It is apparent from community consultations conducted by the Board that the community was not clear about the source of decision-making and funding relevant to the clean up.

Many members of the community were of the view that the clean up package came too late. Consequently, many families undertook their own cleaning. As Ms Wilson stated:

> Unbeknown to me my family had instigated a huge clean up of the house so that we were able to come home early and not have to clean the house. All the surfaces and linen had been cleaned but the house still smelt a bit. They even cleaned the engagement cards and put them in a plastic bag for us. I found the assistance by my family so overwhelming and I was so grateful to be able to be back home.[70]

For others, the clean up package was not comprehensive enough because it only offered vacuuming and dusting, not cleaning of roof cavities. Mr Whittaker informed the Board:

> The Latrobe City Council provided me with limited support during the fires. What I did receive was useless. About one month after the fires had started, the Council provided me with a plastic bucket with a pair of gloves that were too big. I also received a couple of face masks and some vouchers. I did not get any information with the material about how to clean the ash properly or in a safe way. I thought it was a mickey mouse solution to look like they were doing something.[71]

Ms Andrew stated:

> I borrowed a vacuum cleaner from the recovery centre to clean the house. However, there is still dust falling from the ceiling. It is particularly noticeable over the bath tub. As it is a rental house, I have spoken to the real estate agent about…a number of issues regarding the house. I suspect that [the landlord] does not have adequate insurance.[72]

In some cases, people had expectations that a full decontamination of their properties was required for example, replacement of roof and ceiling cavities and replacement of insulation. Some people also perceived that ash residue or particulate matter in houses made them unsafe.

In her statement to the Board, Ms Brooke Burke, Morwell Business Owner, wrote:

> I am very concerned about our house and the ash left in the roof. Since we have returned home the kids have been sneezing a lot and I think it was because of the ash in the roof. I visited the recovery centre for assistance and they told me to have a look in the roof, but also said to be careful with the ash as it should be treated like asbestos.[73]

Initially, both HEPA filter vacuum cleaners and high pressure hoses were available for hire. The community's response to this initiative was that it was out of touch, as high pressure hoses are not recommended for use in Morwell due to the risk of asbestos. Ms Hamilton, explained that:

> … incorrect and unsafe information was being given to our members about cleaning up. For example, the Council was going to provide residents with high pressure hoses to clean their houses, despite the dangers of the use of high pressure hoses on and around asbestos. I believe that this practice is also against the EPA law. The Council had previous experience with the problems created by the use of high pressure hoses on asbestos so I was surprised, to say the least, that the Council was encouraging the use of high pressure hoses

> for clean up with such a large number of houses that contain asbestos in the Morwell area. The pressure hoses were not provided due to these issues but only after I, and others, made a fuss through the local media.[74]

A few people were critical of Latrobe City Council cleaning public places when they considered that priority should be given to cleaning people's houses.

Ms Lund informed the Board that the 'community also saw the bucket program as an insult'.[75] Ms Hamilton expressed a similar sentiment:

> It was like feeding strawberries to an elephant for goodness sakes. A bucket with, I think it had four masks in it with some gloves and a couple of washing vouchers, for the magnitude of the fire that took place with all that smoke and ash, and the ash was horrendous.[76]

The eligibility restrictions on the assisted clean up, like the respite and relocation eligibility requirements, offended some in the community. As the Victorian Council of Social Service (VCOSS) noted in its submission:

> The clean-up and relocation assistance for concession and low income households caused division within the community. Many workers in Morwell are on very low wages, including staff of community organisations, yet (they) were not eligible for assistance.[77]

Mr Hall considered the clean up packages to be generous. He informed the Board that they were calculated on the assumption that 1,900 households would receive professional cleaning services. Mr Hall stated that the generosity of the package is demonstrated by the fact that the current take-up rates of these cleaning services would not exhaust the fund. He also explained that it is unusual for the Victorian Government to provide domestic clean up services following emergencies. Clean up funding is usually limited to public (Council) assets and infrastructure and no similar assistance has been previously provided for bushfires and floods.[78]

FINANCIAL ASSISTANCE FOR BUSINESSES

Local businesses, like residents, were affected by smoke and ash from the Hazelwood mine fire, especially those in the Commercial Road business district close to the mine. Some workers experienced adverse health effects. Many business owners told the Board that they experienced a drop in revenue, although some business owners said that there has been an upturn, especially in hospitality businesses, from the influx of firefighters and government staff.

At the community consultations the Board heard several people express concern about the broader financial impacts of the fire, such as depreciation of house prices. Some also mentioned the stigma attached to Morwell and the Latrobe Valley as a result of the fire and the concern that this would negatively impact the value of property in the region.

STATE FINANCIAL ASSISTANCE

On 3 March 2014, the Victorian Government announced the establishment of a $2 million Victorian Employers' Chamber of Commerce and Industry Morwell Business Relief Fund (VECCI grant). Under this scheme owner managers of actively trading businesses who employ less than 20 employees and can demonstrate loss as a result of the mine fire, are eligible for grants of between $1,000 and $10,000. The scheme was extended into April and as at 23 April 2014, more than 180 grant applications had been approved, totalling over $1 million.[79]

A Small Business Bus service enabled free mentoring and face-to-face advice to over 100 businesses on six days in March 2014. Four workshops with 58 participants relating to business continuity recovery were held, as well as door knocking of local businesses to advise on available assistance. A Small Business Mentoring Service was also available.[80]

Ms Burke stated to the Board:

> My business partner and I went to the information bus and spoke to a man who told us to apply for the small business grant, which would be announced soon. He was helpful. He told us to put on every single loss we had suffered, including the extra time we spent at the business caused by the fire. Overall, we estimated our loss at approximately $11,000 and we applied for a business grant for this amount. We were awarded $5,000 on 24 April 2014.[81]

An allocation was made in the Victorian State Budget 2014–15 of $2.35 million to support the economic recovery of communities following the bushfires in January and February 2014 across Victoria (including the Latrobe Valley), which included $1.2 million for a 2014 Bushfires Economic Recovery Fund.[82]

In addition, eligible small businesses in Morwell, such as primary producers and not-for-profit organisations, indirectly affected by a loss of income as a result of the Hazelwood mine fire, could apply for $100,000 in concessional loans under the jointly-funded Commonwealth and State Natural Disaster Relief and Recovery Arrangements. The loans could be used to fund essential working capital, salaries and wages, creditors, rent, and essential supplies.[83]

Ms Rita Payette, a local farmer, reported that she and her husband were unsuccessful for the VECCI grant because they were deemed not to be Morwell residents despite their property adjoining the mine on the Driffield side. Ms Payette informed the Board she and her husband had applied for the concessional loan.[84]

For the longer term, the Economic Recovery Sub-committee is working with the Community Business Recovery Committee to promote economic development in Morwell, and has developed an Economic Recovery Plan.[85]

GDF SUEZ FINANCIAL ASSISTANCE

GDF Suez has contributed to two initiatives to revive the Morwell community. First, it has established a Community Social Capital Committee with a grant of $500,000 to identify initiatives to build the social capital of Morwell. The Committee is made up of representatives from local community groups. Second, it launched an initiative called Revive Morwell, under which every household received a $100 gift card to spend in the Morwell retail sector.[86]

INSURANCE CLAIMS

Insurance Council of Australia (ICA) representatives attended several community forums and also attended the Community Information and Recovery Centre once a week to provide individual free advice on insurance claims to residents.[87]

At community consultations, several people asked why some insurance claims had been paid but many had not. The Board followed this up with the ICA. The ICA's response to the Board was that insurance policies might cover damage from fire on the property or from a fire coming within a specified distance of the property, but not damage from fires occurring further away. Limiting policies in this way is not unique to properties in Morwell or the Latrobe Valley. Different insurers may not limit their policies and therefore claims for smoke damage can be made. Where an insurer refuses an insurance claim, the claimant can contact the Financial Ombudsman Service to dispute the refusal.[88]

Mr Mitchell told the Board that Mr Alan Wilson, an insurance broker, had advocated on behalf of Morwell residents with limited cover, to seek assistance with cleaning roof cavities.[89] Ms Burke gave evidence to the Board that her insurance company had made an ex gratia payment to her.[90]

PETS AND LIVESTOCK

In its submission to the Board, the Victorian Government stated that during and after the mine fire, Animal Health and Welfare Liaison Officers worked with local veterinarians, Latrobe City Council, and animal aid networks on companion animal matters, to ensure arrangements were in place to support residents and to monitor any impact on animals. Information on caring for animals as a result of the fires was provided by DEPI to the Latrobe City Council for insertion in its residents information pack. Officers also liaised with local veterinarians and other key stakeholders to monitor agricultural production and animal health.[91] DEPI is in regular contact with industry regulators and key agriculture stakeholders. At the time of the submission, no negative agricultural impacts had been reported by producers.[92]

The Board heard from several people at its community consultations who were worried about the health of their pets and livestock. The Virtual Operations Support team described in its submission the experience of one of its volunteers to the Board:

> We had people telling of their cats with Kidney and Urinary infections; of asthma like symptoms in their Dogs and Cats; of birds being lethargic, slow, unresponsive. One of the signs of Carbon Monoxide poisoning in animals is, lethargy. These animals were clearly being effected [sic] by the smoke and ash. They needed help. And we tried desperately to get it to them, only we kept being shunted around. Told to try this number and that number. Talk to this person or that person? Finally, I did get a phone call from Latrobe City Council, telling me that they had a person from DEPI looking into the Animal Respite Centre they were going to set up …As far as I know nothing ever came of it.[93]

LONGER-TERM RECOVERY

The Latrobe City Council, with support from DHS, is managing the longer-term recovery of the community. In his statement to the Board, Mr Hall outlined that longer-term recovery is intended to be a community-led recovery process that began with the clean up. This is actively monitored and supported by the State Recovery Coordination Team.

VCOSS made a written submission to the Board reflecting feedback from community sector organisations in the Latrobe Valley. VCOSS argued that:

> Victorian emergency management policies make provisions to address communities' needs in relation to the preparation, response, relief and recovery phases of emergency management. However the needs of people who are vulnerable or disadvantaged have not been specifically considered within these, and there remain significant policy gaps in how to most effectively build the resilience of and meet the needs of these groups following an emergency event.[94]

As VCOSS points out, community sector organisations expressed concern that they would be dealing with the aftermath for a long time to come, and did not know if this was being planned for or funded accordingly.

On 13 March 2014, two clinical psychologists engaged by DHS, Dr Rob Gordon and Dr David Younger, ran two community sessions. The first session was directed to assisting Latrobe City Council staff and government to improve engagement with local residents. The second session was directed to assisting health professionals provide ongoing mental health support to the community as required.[95]

The 2014–2015 Victorian Budget includes $673,500 for psychosocial initiatives in Morwell.[96]

DISCUSSION AND CONCLUSIONS

The Board commends the State, GDF Suez, the Latrobe City Council and other organisations for their significant efforts towards supporting relief and recovery in Morwell and the broader community. Latrobe City Council worked hard from the first week of the emergency to plan for and implement relief and recovery activities and to advocate for its community, particularly in relation to the scope of the clean up package.

The Board acknowledges that DHS developed tailored relief payments to meet the needs of the residents of Morwell, in particular residents who were advised to temporarily relocate. However, there was confusion about eligibility requirements regarding the respite and relocation payments and flaws in communication, which caused distress in the community. The relief payments created divisions in the local community that have impeded recovery. The Board recognises and supports the decision by DHS to review the Personal Hardship Assistance Program and Implementation Guidelines for consistency and clarity of purpose.[97] The Victorian Government advised the Board that they intend to implement new technology for recording emergency assistance payments.[98] The Board supports this proposal.

While acknowledging that clean up assistance has not previously been provided by the Victorian Government to households after floods and bushfires, the Board considers the self-clean package was inadequate to the scale of the cleaning task faced by community members. The clean up assistance package for Morwell was not announced until 18 March 2014, and there were further delays in implementing the assisted clean up package because Council could not let the cleaning contracts until after the package was formally announced. This diminished the usefulness of the package as many people had already made their own cleaning arrangements.

It is apparent from community consultations that the community was not clear about the source of decision-making and funding relevant to the clean up. The Board agrees with Latrobe City Council that improved systems of coordination and communication are required in emergencies of this extended and complex type, in relation to relief and recovery roles and responsibilities. It recognises that the formal changes to the governance of recovery activities through the Emergency Management Victoria reforms is a means to improving systems of coordination and communication.

The Victorian Government, through Regional Development Victoria, has provided considerable support and assistance for small businesses in Morwell affected by the mine fire. Financial assistance was made available through the Morwell Business Relief Fund, administered by VECCI, and a range of other practical support was also available. GDF Suez has provided additional stimulus to Morwell retailers through its 'Revive Morwell' initiative and Community Social Capital grants.

The Board affirms the Victorian Government's commitment to support local councils through Local Government Victoria, particularly in developing formal and informal networks between emergency management officers and a resource base that Local Government Victoria can work closely with during the response and recovery phases of future emergencies. The proposal for Local Government Victoria to coordinate emergency management officers across local councils is an appropriate approach.[99]

1. *Emergency Management Act 1986* (Vic), s. 4A
2. Exhibit 56 – Statement of Alan Hall, para. 19
3. Adapted from Written submission of the Victorian Government, 22 May 2014, p. 176
4. Exhibit 56 – Statement of Alan Hall, para. 16
5. Exhibit 56 – Statement of Alan Hall, para. 20
6. Exhibit 56 – Statement of Alan Hall, para. 12
7. Exhibit 56 – Statement of Alan Hall, paras 23-25
8. Exhibit 56 – Statement of Alan Hall, attachment 8
9. Exhibit 56 – Statement of Alan Hall, para. 32
10. Exhibit 55 – Statement of John Mitchell, paras 61 & 62
11. Mitchell T1444:24 – T1445:6
12. Mitchell T1445:20-27
13. Hall T1485:1-15
14. Exhibit 56 – Statement of Alan Hall, para. 28
15. Exhibit 56 – Statement of Alan Hall, para. 39
16. Exhibit 56 – Statement of Alan Hall, paras 72 & 73
17. Exhibit 56 – Statement of Alan Hall, para. 78
18. Exhibit 56 – Statement of Alan Hall, para. 78
19. Written submission of the Victorian Government, 22 May 2014, para. 11.69
20. Hall T1497:29 – T1498:25
21. Written submission of the Victorian Government, 22 May 2014, para. 11.70
22. Written submission of the Victorian Government, 22 May 2014, para. 11.69
23. Written submission of the Victorian Government, 22 May 2014, para. 11.70
24. Written submission of the Victorian Government, 22 May 2014, para. 11.71
25. Written submission of the Victorian Government, 22 May 2014, para. 11.75
26. Exhibit 55 – Statement of Alan Hall, para. 91
27. Exhibit 55 – Statement of Alan Hall, para. 88
28. Exhibit 55 – Statement of Alan Hall, para. 87
29. Hall T1490:3-16
30. Exhibit 56 – Statement of Alan Hall, para. 108
31. Community consultation, Latrobe Performing Arts Centre, Traralgon, 16 April 2014, 11 am; Community consultation, Kernot Hall, Morwell, 15 April 2014, 7 pm
32. Written submission of Kylie Stockdale
33. Written submission of Kylie Stockdale
34. Written submission of Rosemary Wigg
35. Written submission of Rosemary Wigg
36. Written submission of Maria Marino
37. Lund T767:22-31
38. Hall T1497:6-17
39. Written submission of Jennifer Barfoot
40. Exhibit 42 – Statement of Ray Whittaker, para. 21
41. Exhibit 57 – Statement of Karen Andrew, para. 36
42. Exhibit 43 – Statement of Vicki Hamilton, para. 14(c)
43. Hall T1505:19-27
44. Second written submission of the Victorian Government, 18 June 2014, para. 8.9
45. Exhibit 56 – Statement of Alan Hall, attachment 9
46. Exhibit 56 – Statement of Alan Hall, paras 43-45
47. Exhibit 56 – Statement of Alan Hall, para. 40
48. Exhibit 56 – Statement of Alan Hall, para. 41
49. Exhibit 56 – Statement of Alan Hall, para. 43
50. Exhibit 56 – Statement of Alan Hall, paras 57 & 58
51. Exhibit 56 – Statement of Alan Hall, para. 59
52. Exhibit 56 – Statement of Alan Hall, para. 59
53. Written submission of the Victorian Government, 22 May 2014, paras 11.82 & 11.83
54. Exhibit 87 – Statement of Lisa Wilson, para. 33
55. Exhibit 55 – Statement of John Mitchell, annexure JM-2, p. 9
56. Written submission of the Victorian Government, 22 May 2014, para. 11.99
57. Written submission of the Victorian Government, 22 May 2014, para. 11.103
58. Written submission of the Victorian Government, 22 May 2014, para. 11.100
59. Exhibit 56 – Statement of Alan Hall, para. 142
60. Exhibit 56 – Statement of Alan Hall, para. 150

61. Exhibit 56 – Statement of Alan Hall, para. 144
62. Exhibit 56 – Statement of Alan Hall, paras 145 & 146
63. Third written submission of the Victorian Government, 23 June 2014, para. 116
64. Exhibit 71 – Statement of Robert Jackman, para. 26
65. Exhibit 55 – Statement of John Mitchell, para. 139
66. Exhibit 55 – Statement of John Mitchell, paras 140-144
67. Exhibit 55 – Statement of John Mitchell, para. 145
68. Exhibit 55 – Statement of John Mitchell, paras 147 & 148
69. Exhibit 55 – Statement of John Mitchell, annexure JM-2
70. Exhibit 87 – Statement of Lisa Wilson, para. 35
71. Exhibit 42 – Statement of Ray Whittaker, para. 24
72. Exhibit 57 – Statement of Karen Andrew, para. 30
73. Exhibit 54 – Statement of Brooke Burke, para. 56
74. Exhibit 43 – Statement of Vicki Hamilton, para. 20
75. Exhibit 30 – Statement of Tracie Lund, para. 34; see also Written submission of Jenny Jackeulen; Written submission of Noah Beecher Klek; Written submission of Brendon Cleland; Written submission of Susan Dietrich; Written submission of Brien Flint; Written submission of Susan Peters
76. Hamilton T1056:21-29
77. Written submission of Victorian Council of Social Service, p. 17
78. Exhibit 56 – Statement of Alan Hall, para. 157
79. Exhibit 56 – Statement of Alan Hall, paras 163-165
80. Exhibit 56 – Statement of Alan Hall, paras 166-168
81. Exhibit 54 – Statement of Brooke Burke, paras 37 & 38
82. Exhibit 56 – Statement of Alan Hall, para. 169
83. Commonwealth of Australia 2014, *Disaster Assist – Victoria Bushfires (February 2014)*, CA, Canberra, viewed 14 July 2014, http://www.disasterassist.gov.au/Currentdisasters/Pages/VIC/VictoriaBushfires-February2014.aspx
84. Written submission of Rita Payette
85. Exhibit 56 – Statement of Alan Hall, paras 160-162
86. Written submission of GDF Suez, 18 June 2014, paras 203 & 204
87. Exhibit 56 – Statement of Alan Hall, para. 155
88. Exhibit 56 – Statement of Alan Hall, para. 154
89. Mitchell T1455:24 – T1456:22
90. Burke T1381:30 – T1382:8
91. Written submission of the Victorian Government, 22 May 2014, para. 11.113
92. Written submission of the Victorian Government, 22 May 2014, para. 11.114
93. Written submission of the Virtual Operations Support Team; see also Written submission of Heather Robertson
94. Written submission of Victorian Council of Social Service, p. 21
95. Exhibit 56 – Statement of Alan Hall, paras 68 & 138
96. Exhibit 56 – Statement of Alan Hall, paras 174, 175 & 181
97. Second written submission of the Victorian Government, 18 June 2014, para. 8.6
98. Second written submission of the Victorian Government, 18 June 2014, para. 8.9
99. Second written submission of the Victorian Government, 18 June 2014, paras 8.12 & 8.13

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PART FIVE
COMMUNICATIONS

5 COMMUNICATIONS

OVERVIEW

This Chapter examines the way in which government agencies and GDF Suez managed their public communications during the Hazelwood mine fire. Detailed analysis of key communication responses by each of the main government agencies is undertaken in previous chapters. This Chapter considers the overall effectiveness of crisis communication methods employed during the Hazelwood mine fire.

Under its Terms of Reference, the Board of Inquiry must inquire into and report on the measures taken by GDF Suez, emergency services and other relevant government agencies in respect of the health and wellbeing of communities affected by the mine fire, including how those communities were informed about the fire's effects and risks.

The Country Fire Authority, the Environmental Protection Authority, the Department of Health, and the Latrobe City Council and a number of community organisations provided information to the community about the mine fire and its effects. Limited information was provided by GDF Suez.

The Board of Inquiry engaged two independent communications experts, Professor James Macnamara, Professor of Public Communication at the University of Technology, Sydney, and Mr Lachlan Drummond, Consultant, Research and Strategy Lead at Redhanded Communications, to review communication during the Hazelwood mine fire. These experts advised the Board on best practice and principles relating to emergency communication, and communication in the context of rural and regional communities. The research and opinions of these independent experts have helped to inform this Chapter of the report.

The Board heard considerable feedback through the community consultation process, public submissions and evidence at public hearings, pointing to significant shortcomings by government authorities as well as GDF Suez in communicating during the emergency. Throughout the 45 days that the fire burned, members of affected communities felt they were not listened to and were not given appropriate and timely information and advice that reflected the crisis at hand and addressed their needs.

The Board acknowledges that all government agencies worked under a great deal of pressure to try to ensure that the community received appropriate information. The Board commends:

- the Fire Services Commissioner, the Country Fire Authority and other emergency services for their communication with the community during the Hazelwood mine fire
- the Latrobe City Council for undertaking a door knock of the entire town of Morwell, covering some 6,400 homes during the event, as well as the efforts of those from Councils as far away as Ararat who volunteered their time to assist with this door knock
- those from Morwell Neighbourhood House, Ramahyuck District Aboriginal Corporation, Asbestos Council of Victoria and Gippsland Asbestos Related Diseases Support Inc., and other community organisations for their efforts during the Hazelwood mine fire in keeping their community as informed and connected as they could under the circumstances
- those residents responsible for the establishment of Voices of the Valley and their efforts to keep their community informed
- the Australian Broadcasting Corporation (ABC Radio) for keeping the community informed during the fire.

Unfortunately, communication responses overall did not reflect international best practice for crisis communication. The community experienced some of the messages from government as confusing and conflicting. Communication did not reach many people in a timely way and in some cases, not at all. Communication was largely one-way with information being transmitted, but not received or understood by the intended recipients. An over-reliance on digital technology, particularly early on, hindered the ability to reach all community members. Empathy was also often lacking, particularly from some government spokespeople. GDF Suez's communication response was particularly deficient.

COMMUNICATING IN A CRISIS

In his report to the Board, independent communications expert Professor James Macnamara, Professor of Public Communication at the University of Technology, Sydney, outlined the elements of effective crisis communication.

Professor Macnamara told the Board that communicating effectively is a central requirement of crisis management and should be prioritised along with the technical management of the emergency at hand.[1] The approach to communication in a crisis can mean the difference between effectively managing an emergency situation (through gaining the trust and support of those affected), and increasing distrust, anger and anxiety in the community.

TYPES OF CRISIS

Professor Macnamara cited the Institute for Crisis Management and specialist crisis researcher Otto Lerbringer, in identifying seven different types of crisis:

1. Natural crises such as earthquakes, tornados, hurricanes, tsunamis, floods, and accidental fire, often described as 'acts of God'.
2. Technological failures such as the nuclear power plant disaster at Chernobyl, the US Challenger spacecraft explosion, and the BP Deepwater Horizon oil rig disaster, as well as other mechanical and technical failures, such as power blackouts, telecommunications network crashes, and shipping collisions, groundings or sinkings.
3. Confrontation crises such as activist attacks, union strikes, or consumer black-bans.
4. Crises caused by malevolence, such as terrorism or sabotage enacted against an organisation or society.
5. Crises caused by systemic issues such as management values and ethics that lead to unsafe practices (eg 'cutting corners' to save costs).
6. Crises caused by deception, such as cover-ups of risks or faults.
7. Crises caused by management misconduct such as fraud, sexual harassment, insider trading, or failure to adhere to standards and regulations.[2]

The cause of a crisis is significant in determining a crisis communication strategy.[3]

Professor Macnamara explained that in the first four categories of crisis identified by Lerbringer, where there is no fault on the part of any organisations involved, there is often a degree of sympathy and public understanding towards those organisations. In contrast, in the fifth, sixth and seventh types of crisis identified above, when the organisation is at fault in some form or another, there is little or no public or political sympathy for the organisation, and often great distrust and antipathy is directed towards it.[4]

Professor Macnamara emphasised that: 'crises have a way of never staying within one of those categories and crises can evolve and emerge, and I think this happened in this case where it started out as a bushfire, which might be a natural crisis, but then turned into a mine fire and then evolved onwards.[5]

Independent communications expert Mr Lachlan Drummond, Consultant, Research and Strategy Lead at Redhanded Communications, expanded on this feature of the Hazelwood mine fire in his evidence to the Board:

> I think what happened here was a crisis that started as a bushfire but could probably be more accurately characterised as a chronic technological disaster or a disaster that led to long-term health and anxiety impacts for the local community. So what started as a bushfire in fact evolved into something akin to a chronic technological disaster. The literature on chronic technological disasters, though somewhat out of the scope of this report, talks about and has a whole range of ways of dealing with these sorts of issues. The reason I cited chronic technological disasters in this report is that I think that's a more accurate classification of the nature of the problem that these affected communities were dealing with.[6]

CHRONIC TECHNOLOGICAL DISASTERS

Technological or manmade disasters are non-natural disasters that often occur near human settlements. The International Federation of Red Cross and Red Crescent Societies defines technological hazards or disasters as:

> Danger originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.[7]

Time (the speed of onset and duration) often distinguishes technological disasters from natural ones. Unlike a natural disaster, there is no acute moment of terror followed by a defined sequence of rescue, relief and recovery. Technological disasters are more often protracted or 'chronic' events, as distinct from the episodic nature of natural disasters. Chronic Technological Disasters are also known as CTDs. CTDs are not new but they are becoming more common as human settlement crosses paths with industrial and related activity.

At the onset of a CTD, when the hazard is identified, there is also an acknowledgement that danger may be prolonged. In the case of a coal mine fire, the first and foremost problem is stopping the fire. The official response therefore is often less concerned about community relief and rehabilitation. There is also a great reliance on state and commonwealth agencies to provide technical help in dealing with the hazard at hand. People can be left feeling 'in limbo' when danger, risk and health effects are being considered. An appreciation of the human element and how reactions may manifest at this time is important.

Each disaster has some commonalities yet CTDs show that expected human responses are not always apparent. Rather, there are different human responses to this type of disaster. Generally, people are better at responding and adapting to natural disasters than CTDs, where knowledge is more limited, particularly in relation to social, physical and psychological factors that constitute the public response (LaPlante & Kroll-Smith, 1989, pp. 134–150).

TIMELINESS

Crisis communication research and international best practice literature advocates that crisis communication planning should begin long before a crisis occurs.[8] Mr Drummond and Professor Macnamara explained to the Board that crisis communication is less effective when it is executed 'on the run' when a crisis is already underway.[9]

Timeliness of communications was a significant issue of concern for the Latrobe Valley community during the Hazelwood mine fire. Professor Macnamara made the following comment to the Board on this point:

> …I do find it very surprising that there wasn't a communications strategy, they were actually writing it, and it was distributed on 24 February. That seems, given that this mine's been here a long time, to me it would be reasonable to think that there could be a problem. Why wouldn't we have a community engagement and communication strategy in place years ago?[10]

Mr Drummond endorsed this statement by noting that: '…writing it [a communications strategy] on the run doesn't strike me as best practice'.[11]

DEMOGRAPHIC CONTEXT

Mr Drummond explained to the Board that the effectiveness of a communication method in informing or creating behaviour change is also determined by how well the chosen method resonates with the target audiences' values. The Morwell region, like any community, required tailored communications that took into account particular social and demographic features.[12]

The demographic data on inner regional Australia provides a rationale for the values that resonate with regional Australians. Values of higher prevalence in regional areas of Australia include high community

orientation, Australian loyalty, traditionalists and political cautiousness. Mr Drummond reported to the Board that these need to be understood clearly, before an event such as the Hazelwood mine fire, in order to develop suitable communications for regional areas.[13]

Overlaying regional values are those values and characteristics specific to the Morwell community. These include a higher than Victorian average of being born in Australia or having both parents born in Australia, a higher than Victorian average of smaller households, a higher than Victorian average of retirees, a higher proportion of people classified as 'blue collar' workers, a higher than Victorian average of low income households and higher levels of unemployment.[14]

As Mr Drummond explained:

> In this case I would have thought that it would be standard practice, or perhaps best practice, to be prepared by understanding the demographic and social characteristics of the community, say of Morwell and the immediate surrounds. I would have thought it would be critical and important to build contacts in advance of any crisis, contacts within the community, community leaders, develop networks, have relationships with editors and publishers of the local paper, and in effect build a team that, in the event of a crisis you can rally quickly…[15]

Those responsible for coordinating communications during the mine fire were only provided with demographic data on Morwell on 17 February 2014 (nine days into the fire) and acknowledged that Morwell, as a particular audience, should have been taken into account in advance of developing the communications strategy.[16]

In his statement to the Board, Mr Craig Lapsley, Fire Services Commissioner, commented that initially one thing that was not done well was making use of established local community engagement structures and networks.[17]

COMMUNICATION MEDIUMS

During a crisis, the timeliness, reach and impact of information are dependent on the appropriateness of the communication medium.

Mr Drummond reported to the Board that he believed there was an initial over-reliance on electronic communications to inform the community during the mine fire. Mr Drummond reported that regional and metropolitan audiences do not differ greatly in terms of digital uptake and usage. Accordingly, it was fair to expect in the first instance that electronic communication would be as effective in the Latrobe Valley as in a metropolitan area. However, other characteristics of a population are better predictors of digital uptake and usage, including age, ethnicity, income and education. In this case, the demographic profile of the Morwell community indicated a need to use a broader array of communication mediums.[18]

Mr Lapsley commented on this generally in his evidence to the Board:

> …we default very quickly to websites and think by publishing a "www" address that everyone will go there. That's not the case and I think we're too quick to default to websites although they're important … and if we are going to default to websites or the internet, using places like the neighbourhood house is a classic example that that's where people go to get information and they go there sometimes to access the information or to be supported on how to use the information… [the information] might be electronic, but you'll be supported in how you access and use it.[19]

Mr Drummond reported to the Board that:

> The communications that appeared to work best were those that were what we might call more traditional or grassroots communication such as the face-to-face contact, door knocks organised by Latrobe City Council. ABC Radio was particularly important to the community.[20]
>
> …Handouts and leaflets, another example of good communications, and then some specific individuals… So, in summary, examples of good communications in this crisis, particularly to this community, it may not apply to all, were typically grassroots and through more traditional channels.[21]

The Board also heard evidence from Professor Macnamara that social media could have been used more smartly by government agencies during the Hazelwood mine fire. Professor Macnamara told the Board that government use of social media was largely restricted to one-way communication rather than working in partnership with the community and generating a sense of dialogue.

He pointed out that traditional media tends to be more one-way and that social media has the potential to be a 'listening medium' not just a 'transmission medium', however too often social media is not used to its full potential.[22] Professor Macnamara agreed with Counsel Assisting that there is more to using social media than 'just posting information'.[23]

In his report to the Board, Professor Macnamara drew upon examples of international best practice in relation to government agencies using social media during crises such as the Boston Marathon Bombing in 2013 and the Queensland Floods in January 2011.

THE BOSTON MARATHON BOMBING 2013[24]

Twitter proved to be the quickest and most reliable communication medium for the Boston Police Department to communicate with the community, media and other key government agencies.

The Boston Police Department's Twitter account went from 54,000 followers to over 330,000 following the crisis. Twitter communication reached 49 million people in only five days.

The Boston Police Department only had three police officers and three civilian staff handling communications during the crisis. Importantly, all had received social media communication training including writing Facebook and Twitter posts in addition to more traditional media and public communication statements. This was supported by a crisis communication plan that included social media.

Twitter was considered a valuable and essential communication tool that helped the Boston Police Department manage their communication by enabling them to 'connect directly with the community.' This approach 'built a cohesive community, reduced panic, engaged the public in the search for suspects, and kept people safe.'

Journalists following the Boston Police Department Twitter account quoted directly from its tweets on live radio and TV broadcasts.

When the Boston Police Department announced a news conference via Twitter, the mistake was quickly corrected. Conversely, when several news outlets incorrectly reported that a suspect was in custody, the Boston Police Department corrected this via Twitter. Fast correction of misinformation is one of the benefits of using social media during a crisis.

The Boston Police Department also tweeted images such as photos of the suspects which thousands of followers retweeted to their social networks and which assisted in their capture.

THE JANUARY 2011 QUEENSLAND FLOODS[25]

The Queensland Floods of January 2011 affected large parts of south-east Queensland and inundated some 30,000 homes. The Twitter hashtag #qldfloods very quickly became a central site on social media for information in a rapidly evolving event. Key government agencies such as the Queensland Police (which has its own Twitter account) quickly adopted the #qldfloods hashtag.

The use of social media by government authorities showed that Twitter offered 'exceptionally flat and flexible communicative structures' that allowed the public to listen in to institutions, news outlets and other individuals, whilst also allowing 'institutions, emergency services and journalists to listen in to the experiences of locals in the midst of the crisis.'[26]

Twitter allows links to be included in short tweets, enabling messages to be sent quickly with a link to longer documents containing detailed information, including emergency plans and advice.

TONE AND STYLE

Tone and style are particularly important aspects of crisis communication. As Mr Drummond reported to the Board:

> …in order for an affected community to identify with communicators, it is critical that such people exhibit empathy, genuineness and concern. Speakers that are 'wooden', bureaucratic and too 'on message' are likely to be rejected. This means acknowledging the crisis quickly, with sincerity and exhibiting a willingness to engage and help. Failure to adequately 'speak the language' and use the channels of the community will lead to poor, piecemeal and ultimately deficient communications.[27]

Mr Drummond emphasised to the Board that the ability to recognise whether or not you are received empathetically is crucial:

> People in a crisis need to feel validated, they need to feel that their anxieties are being listened to, being heard, and so empathy and understanding is a critical tool in validating people's emotional state in a crisis; that is to say, we hear you, we understand where you're coming from and therefore we know how to help you in the best possible way. So it's not an admission of guilt or liability, it's really saying, we understand you, we empathise with you and, in so doing, it builds trust and I'd argue that trust is the cornerstone of crisis communications.[28]

INFORMATION VERSUS COMMUNICATION

Professor Macnamara told the Board that information transmission is not the same as communication:

> …information is not communication and it's a common misunderstanding. Communication, in simple terms is about the information that arrives and is understood in the mind of the audience, it's about interpretation and meaning-making… I think throughout this there was a lot of information, but at the end of the day the community had fears that were not addressed and had concerns that were not addressed, so this information had not turned into meaning and interpretation within the community… if it's one-way it's not communication, it's information transmission.[29]

APPROACH TO COMMUNICATION DURING THE MINE FIRE

STATE COORDINATION

During a crisis, the Emergency Management Joint Public Information Committee (EMJPIC) is a coordinating committee for emergency communications.[30] The EMJPIC is not the public face of an emergency—this is the role of spokespeople from various government departments. During an emergency, the Chair of the EMJPIC attends State Emergency Management Team meetings.[31]

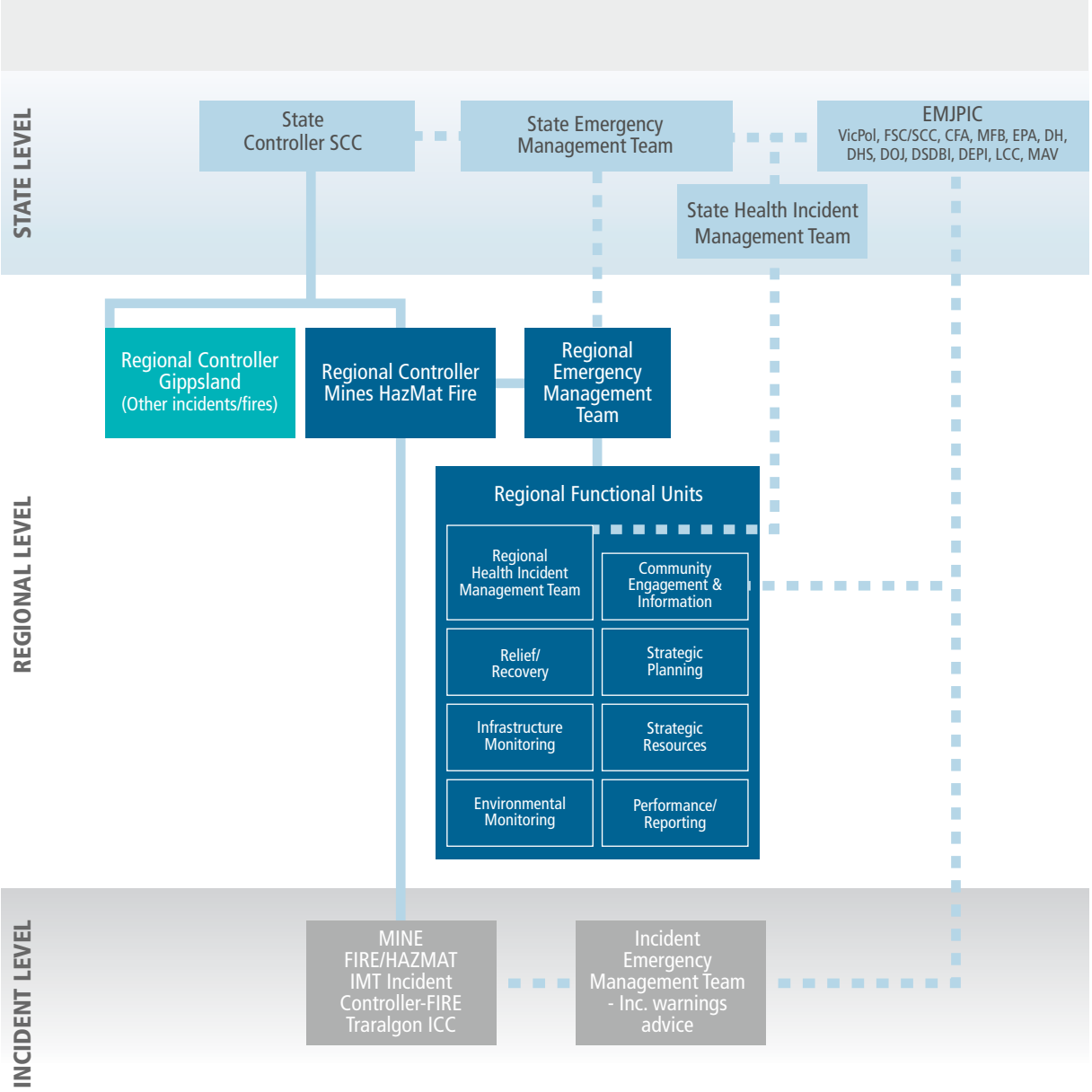
Ms Merita Tabain, Chair of the EMJPIC, described the purpose of the EMJPIC as follows:

> The foremost responsibility of EMJPIC is to ensure that public information is coordinated and distributed in a timely and accurate manner to inform and advise community members during a major emergency, as well as ensuring that media needs are met, through a coordinated multi-agency approach.[32]

Each department and government agency also has their own communications team, with the role of spokesperson filled by key office holders. In relation to the Hazelwood mine fire, key spokespeople included Mr Lapsley, Fire Services Commissioner, Dr Rosemary Lester, Chief Health Officer, and Mr John Merritt, former Chief Executive Officer of the Environment Protection Authority (EPA).[33] Other state and local government representatives also made public statements and participated in press conferences.

Figure 5.1 shows how the EMJPIC linked to the broader emergency management structure responding to the Hazelwood mine fire.

Figure 5.1 Operational communications structure for the Hazelwood mine fire [34]



STATE COMMUNICATIONS STRATEGY

A government communications strategy was developed by the EMJPIC in response to the Hazelwood mine fire.[35] On 16 February 2014 (a week after the fire started), a draft 'Communications and Stakeholder Engagement Strategy' was provided to Mr Lapsley and Incident and Regional Control Centre leadership teams.[36] This strategy was further developed as the crisis continued.

In a version of the 'Communications and Stakeholder Engagement Strategy' dated 24 February 2014, the following communications principles were outlined:

- 'If you know it, tell the community' should be the approach for communication at all times
- ensure internal as well as external communication is maintained at all times
- target communication to individual communities needs and structures
- Incident Control Centres will utilise the systems available to them to ensure that appropriate warnings will be issued including text messages, social media and pre-recorded phone calls
- ask the community how best to engage with them
- where possible utilise local people to engage with local people
- consult with relief and recovery agencies when developing messages to support relief and recovery efforts
- Incident Management Teams will utilise all available technology and local contacts to alert relevant communities in the event that the risk increases
- use a range of key communications (eg media communication with the Latrobe Valley community) during the Hazelwood mine fire.[37]

In her evidence to the Board, Ms Tabain stated her opinion that the communications focus in the first week (up until the weekend of 15 and 16 February 2014) was very much on the fire and the mine:

> …really that first week of the fire, from my perspective and from EMJPIC's perspective, the issue of smoke and health and wellbeing of the community really wasn't an issue that was raised. For us, this is advice provided to us, it seemed the issue really was around the fire in the mine, and the threat to power supply… That weekend that's referred to, that is really when things started to shift and everyone understood that this is actually something different, and it's more than just a fire within a contained space, which is the understanding that we had.[38]

In his report, Mr Drummond stated that this characterisation of the crisis influenced how authorities reacted to it, that is, because the mine fire started as a bushfire, communications associated with a bushfire were deployed.[39] The communications strategy initially drew upon the joint EPA and Department of Health Bushfire Smoke Protocol, which is aimed at raising community awareness (particularly for at-risk-groups) during bushfire events that are generally small in size, scale or duration.

Mr Lapsley told the Board that the State Emergency Management Team adopted a 'one source one message' policy in relation to communicating with the community about the mine fire. He explained that: 'one source, one message has been driven by the 2009 fires, so it's had a very strong fire overlay, easy to adopt in other hazards, particularly in the natural hazards, so flood, storm.'[40]

Professor Macnamara told the Board that while a single authoritative source of information can work well in an emergency, this situation required consistency of message across different agencies.[41]

Mr Lapsley told the Board that executing the 'one source one message' policy was challenging, in particular ensuring consistent and timely information on different agency websites.[42] He conceded that there needed to be a better understanding of how 'one source, one message' would be used in an emergency that related to human health (not just fire), but maintained that the principle itself is 'solid'.[43]

KEY COMMUNICATION CHANNELS

From 11 February 2014, the EPA issued the first of a series of smoke advisories. In the following days the Department of Health began issuing the first of a series of health alerts, advisories and community information sheets.[44] The CFA and Fire Services Commissioner issued a series of alerts about the broader context of the bushfire fire season as well as some preliminary communication focused on the Hazelwood mine fire.[45]

On 14 February 2014, the first of two major community meetings arranged by government agencies, was held at Kernot Hall in Morwell. The Incident Controller led this first meeting. Representatives from the CFA, Metropolitan Fire Brigade (MFB), Department of Health, EPA and Latrobe City Council addressed the

meeting. Representatives from VicRoads and Victoria Police were also in attendance and questions were taken from the floor. Topics covered the nature of fire as a protracted incident, air quality and the impact of smoke on health.[46]

After the community meeting the EMJPIC reported to the State Emergency Management team that:

> The rising number of firefighters who have been treated for carbon monoxide poisoning at the open cut mine has prompted increasing community concerns. This is being exacerbated by fire union claims about unsafe work conditions. EMJPIC is coordinating a comms strategy to reassure the community, and provide advice from Health and the EPA on how to mitigate the effects of the smoke…[47]

Mr Lapsley told the Board that there was a turning point in the incident on 14 and 15 February 2014 when the fire increased in size, which changed the whole strategy.[48]

On 18 February 2014, a second major community meeting arranged by government agencies was held at Kernot Hall, Morwell. As noted in Chapter 4.2 Chronology of events, Ms Tabain stated in her evidence to the Board that there were not enough government representatives present who were senior enough to give definitive answers.[49] A communications officer volunteered to facilitate the meeting, in lieu of a senior government representative.[50] This meeting highlighted the depth of concern within the Morwell community about the fire and the potential effects of the smoke.[51] Mr Lapsley told the Board that it became clear to agencies from this meeting that the community had become increasingly frustrated about what they perceived as deficiencies in communication about 'what the incident really meant.'[52]

Prior to the meeting on 18 February 2014, the State Emergency Management Team recognised that it was important to have experienced and senior members of local government present to support the conduct of community meetings.[53] Ms Tabain was unable to explain to the Board why there were not sufficiently authoritative people at the community meeting on 18 February 2014 to answer questions from the community.

From the third week of the mine fire, a broad range of communication mediums were employed by all government agencies to more effectively engage with the community. This included door knocking by the Latrobe City Council. From 22 April 2014, a communications officer was engaged by Council for a three month period to support community engagement and communications activities.[54]

Web-based information and social media, including, texting, Twitter and Facebook were also used throughout the Hazelwood mine fire. In her evidence to the Board, Ms Tabain acknowledged that the social media command centre that was established on 26 February 2014 (17 days after the fire started), came about too late.[55]

THE COMMUNITY'S EXPERIENCE

During the community consultations conducted by the Board, the Latrobe Valley community expressed that they felt confused, anxious, disaffected and angry by a lack of information about the mine fire. Members of the community also expressed frustration with the conflicting nature of the advice provided, and the delay in providing advice that was accessible, relevant and meaningful to them.

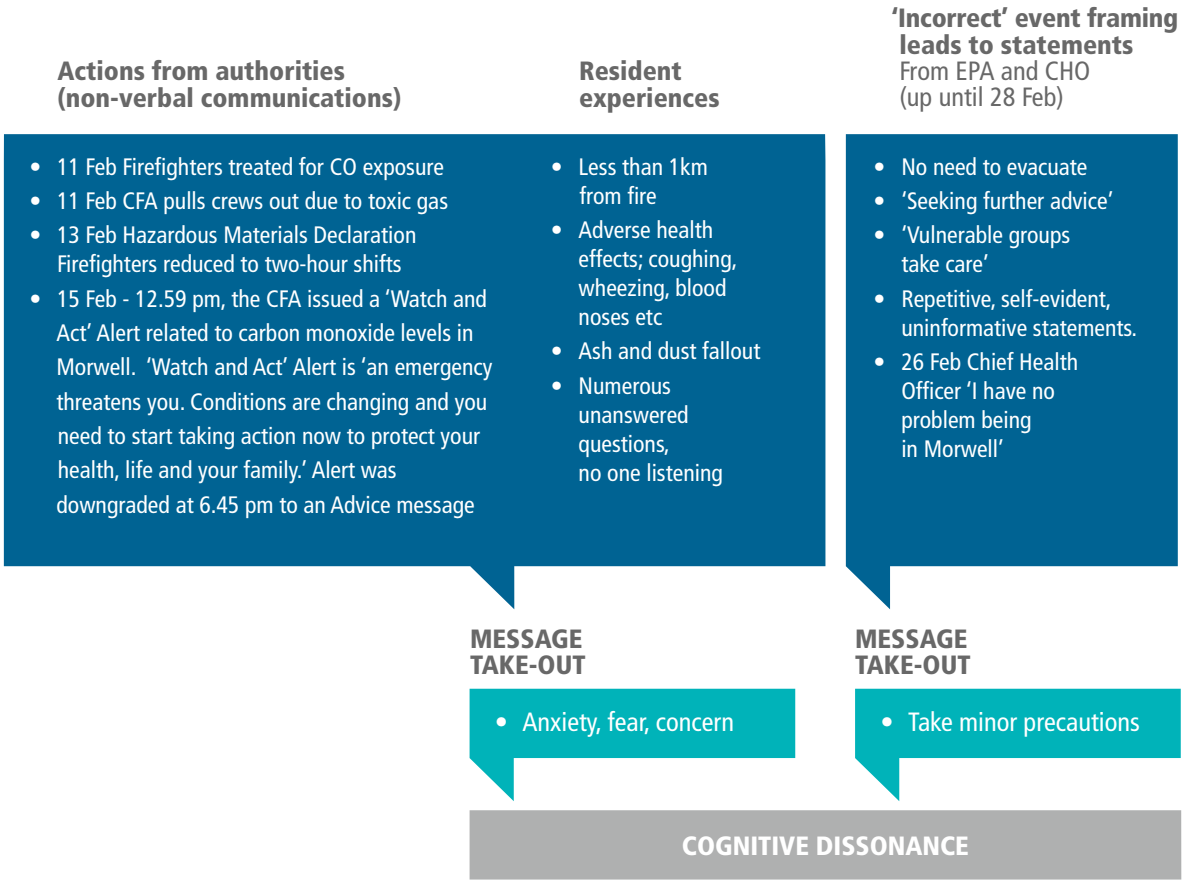
The community told the Board of a 'disconnect' between messages from key authorities and what they were actually experiencing. As Mr Ron Ipsen of Morwell remarked in his submission to the Board: 'The residents of the Latrobe Valley knew that what they were being told was not what they were experiencing.'[56] The community perceived government and agency messaging as confusing, contradictory and lacking credibility.[57]

Mr Drummond told the Board:

> My sense is that throughout this crisis the authorities and individuals, whilst doing their best and working under difficult circumstances, didn't fully appreciate the socio-economic status, the values, the attitudes, and even the needs of the community, and so, what I contend is that there's a disconnect between the communications that were given and what was in fact received.[58]

What the community was experiencing can be described as cognitive dissonance.[59] Cognitive dissonance is explained in Figure 5.2 below.

Figure 5.2 Cognitive dissonance during the Hazelwood mine fire[60]



Members of the community also reported that lack of coordination among the agencies involved in managing and responding to the mine fire resulted in confusing messages, with agencies appearing to contradict each other. This left affected communities struggling to find the answers and reassurance they were seeking.[61]

An example provided to the Board was the Chief Health Officer's temporary relocation advice on 28 February 2014. Members of the community told the Board that the EPA and the Department of Health issued independent notices about relocation that did not tell the same story as the Chief Health Officer's advice. The Department of Health's notice for temporary relocation, issued just after lunchtime, makes no mention of the EPA, air quality, or where to go to find information on air quality.[62] The EPA's notice, issued at 5.45 pm on the same day, was a high level smoke advisory for the Latrobe Valley and included pre-arranged statements, including from the Chief Health Officer, but with no reference to the temporary relocation advice.[63]

Ms Tracie Lund, Morwell Neighbourhood House Coordinator, told the Board that there was a lot of talking by authorities, but not much listening:

> I know that information was being fed up through two government departments, through Council, as much as possible and there did seem to be a lot of hoo-haa'ing up the top, but I do not feel that the community was listened to well and I don't feel that the people on the ground that had the information from the community were listened to very well, and perhaps that's something we can work on in the future, about marrying up the differences between the grassroots and the top heavy, because it could work a lot better if the bottom was included a little bit more I think.[64]

Mr Drummond reiterated this sentiment to the Board:

> In this particular case the opportunity for two-way communications was, I think, severely limited…the community had anxieties and concerns but their ability…to voice those and communicate those concerns to the relevant authorities was minimal.[65]

> In order to fill an information vacuum, many people in the community turned to the internet, including social media, looking for answers, advice and support. This proved to be helpful for some but also added to the confusion for others. Information on the internet about the mine fire was on occasions inaccurate and speculative.[66]

EMERGENCY SERVICES

During community consultations, the Board heard that emergency services, in particular the CFA provided timely and helpful community information, at a range of levels and through a wide variety of media.[67] From 9 February 2014, the CFA provided community information and warnings through its Fire Ready app, emergency alert text messages, its website and other media channels.[68]

The Board heard that the community considered Mr Lapsley to be forthright, honest and informative in his public statements. The frankness of Incident Controllers at community meetings was also appreciated.[69] As firefighting continued, the CFA was highly visible to the community and implemented a range of face-to-face communication strategies, including at community meetings, through the community information bus and through Morwell Neighbourhood House.[70]

The CFA distributed information electronically but also had a greater physical presence 'on the ground' than other government agencies. The CFA was actively involved in public meetings and mobile van tours, as well as having a significant role in firefighting at the mine.[71]

HEALTH AND HUMAN SERVICES

A consistent theme throughout community consultations and public submissions was that authorities such as the Department of Health did not communicate effectively with the community. The Chief Health Officer, in particular, was perceived as lacking empathy and compassion. Mr Pat Bartholomuez of Morwell, stated in his public submission that:

> The State's Chief Health Officer meant well when she said the smoke was harmless and that the intensity of the smoke could be measured by visibility without scarce measuring equipment (my words). The people took this as "Shut up, stop whingeing and get on with it." What she could have said was "I know that you are suffering, we have not had a situation like this before and we are carrying out urgent research, how can we help?"[72]

Ms Vicki Hamilton, Chief Executive Officer and Secretary of the Asbestos Council of Victoria (ACV) and the Gippsland Asbestos Related Diseases Support Inc. (GARDS), told the Board that messages from the Chief Health Officer were confusing:

> During the mine fire, the key issue raised by ACV/GARDS members was the lack of communication particularly in regard to the health effects of the fire and smoke. Our members were concerned about the toxicity of the smoke, the short and long-term effects of the smoke, the lack of initial air monitoring and the considerable stress and potential mental health issues arising from the fire. Our members were not able to find the answers to their questions.[73]

> … the Chief Health Officer said that they were treating the fire just like any other bushfire. The community knew that the mine fire was not a bushfire and it was a very different fire with respect to how it was to be treated and what was contained in that fire. The community had no confidence in the authorities because of this message…the Chief Health Officer said that there would be no long-term health effects from the fire. I was confused as to how would she know this as there had been no references made to how she could confidently make that assessment…[74]

The temporary relocation advice given by the Chief Health Officer on 28 February 2014 was seen by many in the community as inconsistent with earlier advice because, within the context of the event overall, it was not clearly explained why temporary relocation was being advised on that particular day, nor why the railway line was the geographic marker for different treatment.

Some in the community interpreted this advice as: 'yesterday was safe enough to stay, the last three weeks were safe enough to stay, but today, it is not safe to stay.'[75]

As described by Ms Annette Wheatland, Gippsland Regional Manager, Southern Cross Care Victoria, who works in Morwell:

> It was a difficult time because for three weeks we were told it was safe to be in Morwell and then suddenly we were told that vulnerable people should relocate. It was hard to understand why only the vulnerable people were being recommended to relocate when we were all being affected by the smoke in Morwell.[76]

In his evidence to the Board, Dr Christopher Brook, State Health and Medical Commander referred to front line services like Ambulance Victoria, Latrobe Valley Hospital and Nurse-On-Call as being the 'arms and legs' of the Department of Health and so by extension, acting as the Department's face-to-face contact with the community.[77] Some members of the community did not feel this way. Ms Lund told the Board that: '…the community did not see the ambulance service as representatives of the Department of Health. There were no people from the Department of Health on the ground with the community and this caused a lot of anger.[78]

Communication between the Department of Health, local general practitioners and health networks is dealt with in Chapter 4.6 Health response.

As detailed in Chapter 4.7 Relief and recovery, the Department of Human Services (DHS) was responsible for managing relocation and respite assistance. Members of the community gave evidence to the Board that they felt the eligibility criteria for relief packages were not adequately explained and that they were unclear about who was eligible for assistance because they were unable to access information and advice from the DHS.[79]

ENVIRONMENT PROTECTION AUTHORITY

Community consultations, submissions and evidence heard by the Board revealed a high degree of frustration about the EPA's inability to communicate effectively with the community during the Hazelwood mine fire.

In his report, Mr Drummond summarised the community's concerns as follows:

- information was slow to be released
- information was not particularly helpful
- information about the relative safety of the fire, smoke and air did not match the community's experience of adverse health effects
- inability to explain and adequately address concerns
- lack of trust in data and figures, the credibility of the EPA was damaged when they framed their primary responsibility as one of reporting to the Chief Health Officer and not to the community
- information was at times overly simple, repetitive and unhelpful while other communications were complex and not adequately explained.[80]

Early public communication by the EPA downplayed the risks of the mine fire. The EPA's first post on Twitter on 12 February 2014, and several subsequent tweets, advised the public that there was little or no risk to their health. Tweets posted by the EPA on 12 and 13 February 2014 also advised of a 'very low level of carbon monoxide impacts'.[81]

Mr Merritt told the Board that:

> As the incident unfolded, it became clear that more information was required by the community. The challenge was that the next level of information, such as individual test results, started to introduce more complex scientific ideas, principles and concepts, and as such required substantially more explanation and translation into easily understood terms.[82]

Mr Drummond's analysis was that the EPA found itself in a difficult position trying to strike the right balance between providing as much information as possible, while trying to ensure it made sense and was scientifically sound. Whilst some information was too repetitive and basic (such as EPA smoke advisories with template wording), other advice was too complex.[83]

One of the questions posed in a 'frequently asked questions' fact sheet issued by the EPA on 24 February 2014 was: 'The data on EPA's website looks alarmingly as if we've exceeded air quality standards, is that right?' The answer provided in the factsheet was: 'Data readings are the actual scientific measurements for each air pollutant. The data readings are recorded in different units of measure depending on the type of pollutant'. Ms Tabain of the EMJPIC conceded that this was not an example of good communication and that a simple answer to this question would have been 'yes'.[84]

As part of his peer review response to the EPA, Associate Professor Howard Bridgman from the School of Environmental and Life Sciences at the University of Newcastle, reported back to the EPA that answers to many of the questions on the EPA website were 'broad, generic and sometimes vague'.[85] Based on his experience with air pollution in the Hunter Valley in New South Wales, Professor Bridgman noted that:

> …the interested public do not consider these kinds of answers favourably. They want better information. I recommend that the answers to the questions on the website be revisited with the aim to provide some more details and more specifics, but still keeping the answers short, simple and direct.[86]

The EPA's 24 hour telephone line was relied on by many people in the community. Ms Brooke Burke, Morwell Business Owner, gave evidence to the Board that she contacted the EPA by telephone on at least two occasions for information about the impacts of the smoky conditions after the advice by the CFA to close windows and doors.[87] Ms Burke sought advice on whether it was safe to continue running dance classes at her studio:

> I'd contacted the EPA and tried to look for any other places I could contact to find out whether it was safe for us to be there. But it was very hard to find someone that could tell us if we were or weren't (safe). Obviously not being a government agency, we didn't have anyone in direct contact with us as to whether the building was safe to be in.[88]

From 21 February 2014, the EPA had a number of visual representations of the distribution of air pollution on its microsite. However, some key visual representations were not made available to the public, including images of the TravelBLANkET (used to measure particulate levels in the air). Associate Professor Bridgman told the EPA that: 'The spatial display is impressive and easy to understand and should be made available to the public via the dedicated website'.[89]

LATROBE CITY COUNCIL

Many members of the community expressed to the Board that they found it very difficult to get information from Latrobe City Council during the crisis. Community members acknowledged that the Council was put in a difficult position during the mine fire and that it was under-resourced to respond to the emergency.[90]

The Council usually makes information available on its website about preparing for 'Fire, Floods and Other Emergencies'. Information on fires is mainly related to domestic blazes. The website includes helpful links to relevant specialist agencies such as the CFA, EPA, and the Department of Health.[91]

There was limited information on the Council's website in relation to the Hazelwood mine fire during the period February–March 2014. The Council also made limited used of social media.[92]

In its submission to the Board, the Latrobe City Council described a wide array of government agencies, senior officials and elected representatives involved in communicating to both the Council and the community throughout the event, often at the same time. The Council considered that this reduced effective communication, as information and messaging coming from multiple government agencies was not coordinated or consistent.[93]

The Council also submitted to the Board that it was requested to attend various announcements and press conferences at short notice, often with no clear indication as to what was being announced or what its role was. Not only did this place additional pressure on Council staff, it created confusion in the community

as to what role Council had in response to the Hazelwood mine fire (generally councils are involved in the recovery phase of an emergency, not in the response phase while the event is still taking place).[94]

The Council further submitted to the Board that at other times, announcements by government agencies and authorities that had resource implications for the Council were made without notifying the Council. This meant Council was unable to respond in an appropriate and timely manner. This in turn fuelled anger in the community by raising unrealistic expectations of Council's ability to respond to these announcements and to do so immediately.[95]

Mr Robert Jackman, Morwell resident, explained his experience with the Council in his statement to the Board:

> In the second week after the fire I heard on the radio that Ambulance Victoria had set up a medical assessment centre for members of the community to access. I did not hear the location of the assessment centre so I rang the Latrobe City Council. The person who answered my call did not know anything about the assessment centre. The person put me on hold to find out further information. Upon returning to the call, they told me that it was at the Mid Valley Shopping Centre opposite Katies. I went to that location and there was no medical assessment centre. I eventually found it nearby in Saskia Way, next to the Ambulance Victoria headquarters in Morwell. I thought that there would be a lot of people there but I was the only one. I got checked out and was told I was okay. I was surprised that the Latrobe City Council did not know about the medical assessment centre and I think they should have known what was going on...[96]

Ms Burke also described her experience with the Council during the first week of the fire: 'I contacted the Shire to ask if there was someone to speak to about what local businesses should do. They said there wasn't anyone appointed at this stage.'[97]

In his statement to the Board, Mr John Mitchell, Acting Chief Executive Officer of the Latrobe City Council acknowledged that:

> …there were instances where the call centre, which was staffed with contractors, was not as up to date as it should have been, in the sense that it did not always have all up to date information to hand. In light of this, the Council introduced a new briefing method to increase the knowledge of those at the call centre.[98]

Members of the community also told the Board that they were frustrated with the information provided by the Council relevant to the cleanup package they provided the community. In his report to the Board, Mr Drummond noted that, 'The provision of a clean up package in the form of a bucket, gloves and vouchers was widely derided for being inadequate and lacking any helpful communications on how to approach decontamination.'[99]

GDF SUEZ

Communications from GDF Suez were noticeably absent over the 45 days that the mine fire burned.[100]

A spokesperson for GDF Suez, Mr Trevor Rowe, was interviewed on 9 February 2014 by ABC Radio.[101]

GDF Suez provided limited information relevant to the fire on its website. It provided some information through the CFA website, and later during the crisis, it authored full-page articles that appeared in the local paper, the Latrobe Valley Express.[102]

On 20 February 2014 (11 days after the start of the fire) GDF Suez posted a statement on the CFA's website with a series of questions and answers, which included the following sentence: 'We fully understand the inconvenience and concern that the smoke from the fire has caused for people living in surrounding areas.'[103]

In his report to the Board, Professor Macnamara stated: 'Absence is seen as synonymous with silence and is seen very negatively…'[104] Professor Macnamara summed up GDF Suez's public communications strategy as one that could be interpreted as showing disdain for the local community, and at best, showing a lack of sensitivity and concern.[105]

GDF Suez claimed that its communication approach adhered to the State's 'once source, one message' policy.[106]

MORWELL NEIGHBOURHOOD HOUSE

Morwell Neighbourhood House provides an important local base for people to access information and stay connected to their local community. In times of crisis or emergency, it has an essential role in disseminating information to locals, as well as making contact with those who are not connected to the internet and do not use social media.[107]

In her evidence to the Board, Ms Lund described how she was unable to provide the information and help that people needed, because this information was not available through other channels:

> So the day of the relocation… I was watching on the news for the announcement of what was going to happen, and then I knew we'd get questions, but we were ping-ponging from site to site trying to figure out what was the correct information to give them. So we'd print out what we'd think was the correct information for that day and then later that night or later that day I'd find out that, no, no, it's actually a different number to call or – so it was very difficult and time-consuming to figure out how to get the correct information so that we could have it there to give to the community.[108]

The Neighbourhood House found itself in a situation of being unable to assist members of the community who turned up angry, upset and struggling to find answers.[109]

INDIGENOUS COMMUNITY

The Board heard from Ms Karen Andrew, Youth Suicide Prevention Counsellor with the Ramahyuck District Aboriginal Corporation, which is located at the Central Gippsland Aboriginal Health Service in Morwell. Ms Andrew described the local indigenous community as having a very high level of disadvantage, which includes in some cases three generations of unemployment and lower than average life expectancy (even when compared with other indigenous communities).[110]

Ms Andrew told the Board that information was not specifically made available to the indigenous community, and that no direct contact was made with her organisation from any government agency to inquire what the indigenous community needed. Ms Andrew stated that she was only made aware of information and assistance about the mine fire when she came across a flyer at the Latrobe Community Health Service and set about photocopying it herself for distribution. Ms Andrew attended community meetings from that point on, including those held on 14 and 18 February 2014.[111]

Ms Andrew told the Board that the indigenous community needs face-face contact, as they generally do not have access to or use the internet. Many people in the indigenous community in the Latrobe Valley are also illiterate.[112]

Ms Andrew communicated with the local indigenous community about the Hazelwood mine fire in person. She advised them where they could go for assistance and relocation support. Ms Andrew was particularly concerned for those members of the community who were unwell, such as the elderly and young mothers with small children.[113]

Ms Andrew's evidence is consistent with feedback from the local indigenous community to the Board during its community consultation sessions.

VULNERABLE GROUPS

The Board heard from a diverse range of community members and organisations, during the community consultation sessions and through public submissions, on how they felt communication was handled during the Hazelwood mine fire.

Many groups – including the elderly, disabled, homeless or displaced, and people from culturally and linguistically diverse backgrounds – as well as those advocating on their behalf, such as Deafaccess Gippsland,[114] felt that communication was not handled well, nor did it meet their particular needs.

VOICES OF THE VALLEY

Voices of the Valley is a local grassroots community organisation that was established during the Hazelwood mine fire, in direct response to the information vacuum and lack of advocacy the community was experiencing.

In his evidence to the Board, Mr Simon Ellis, former President of Voices of the Valley, explained how the group facilitated public meetings, distributed information via a dedicated Facebook page and coordinated collection of a survey of people's experiences, which was later submitted to the Board of Inquiry.[115]

ABC RADIO

The community commended the ABC Radio in eight out of the ten community consultations, singling it out for working particularly well during the crisis.[116]

DISCUSSION AND CONCLUSIONS

KEY COMMUNICATION ISSUES

The nature of a crisis, emergency or disaster needs to be recognised in order to frame it appropriately. The Hazelwood mine fire went very quickly from a bushfire related event, to an industrial fire (chronic technological event), to a significant and lengthy environmental and health crisis. By 12 February 2014, Mr Lapsley recognised that the Hazelwood coal mine could burn for up to one month,[117] yet the way the crisis was framed in communications planning and delivery did not reflect the true nature of the event or the length of time it was foreseen as running.

The State Emergency Management Team and the EMJPIC acknowledged broader concerns about health and environment on 14 February 2014. However, the scale and importance of these issues was not fully appreciated until sometime after that.[118]

LACK OF PREPAREDNESS

The State did not have an existing communications strategy to apply to an emergency like the Hazelwood mine fire.[119] It was not until 16 February 2014 (a week after the fire started) that a communications strategy was prepared, and not until 20 February that the document was adopted. The State's Communications and Stakeholder Engagement Strategy appears to have been finalised and distributed on or around 24 February 2014 –15 days after the mine fire started.[120] This was more than a week after the first community meeting, where agencies became aware of the community's need for better communication. This may help explain why community members believed that: 'It took government two weeks to get here, to even start thinking about it.'[121]

The Board accepts the analysis undertaken by Mr Drummond and agrees with his opinion that while the demographic make-up of audiences does not directly determine the effectiveness of communication, it significantly influences how a communication should be developed for an audience. The Board considers that if work similar to this analysis had been undertaken, and completed as part of crisis communication preparation, then the ability of government agencies to respond in an appropriate and timely way would have been much improved. It is imperative that reaching the target audience is done in a timely and appropriate way.

The Board considers that it was unfortunate that the strategy had to be written and executed during the crisis. This demonstrates that preparedness in crisis communication fell short and subsequently undermined the ability of government agencies to respond effectively.

The Board agrees that 'one source, one message' is an important and useful communication principle for bushfire and perhaps some acute emergencies. It may be less useful for a protracted crisis involving a chronic technological or industrial type event where health and the environment become central points of concern. The Board considers the 'one source one message' approach needs to be reviewed for crises that go beyond bushfire.

The first media release in relation to the fire was issued by Latrobe City Council 10 days after the fire started. The first media release from a senior government leader was issued 11 days after the fire started. Other than an interview undertaken by a GDF Suez spokesperson on 9 February 2014, GDF Suez did not issue a media release until 11 March 2014 – 28 days after the fire started.[122]

Government agencies and authorities issued a considerable amount of electronic and print material and engaged in a number of press conferences and community meetings. There was also an acknowledgement after the first week that the initial approach to communications needed to be changed

in order to respond to the particular circumstances of this crisis. In most cases, government agencies understood that their communication strategies needed to be adapted to suit the situation and audience but this did not take place until well into the second and third week. A lack of preparation resulted in an inadequate response in this instance.

During the third week of the crisis, the Latrobe City Council organised a door knock of Morwell residents to inform them of the status of the fire and to discuss health and other concerns.[123] Both the door knock by the Latrobe City Council and the letter drop by the DHS were sensible adaptations to the previous communication strategy, but occurred too late.

COMMUNICATION CHANNELS

The Board accepts Professor Macnamara's view that social media is useful where it facilitates a conversation with the community. Social media can be a very effective tool for hearing and reading what the community are saying and how they are responding, in turn enabling interventions to acknowledge and correct rumour and innuendo.[124]

The Board affirms the use of social media by government agencies and encourages the continued use of this medium. It is an important communication tool to reach many people very quickly. However, other more traditional forms of communication should not be sacrificed or forgotten about and should be used alongside social media in times of crisis.

The Board supports the use of multiple channels of communication that reach the greatest amount of people and best suit the needs of the audience, but notes that traditional mediums were not used readily or early enough. In some instances, digital technology was used by government agencies to the detriment of other forms of communication that could have worked alongside more modern mediums. This was important in the case of the Hazelwood mine fire as the demographic circumstances of the Morwell community are diverse, with high representations of elderly residents, those with low socio-economic status, residents with culturally and linguistically diverse backgrounds, those with limited literacy and those with limited internet access.[125]

COMMUNITY ENGAGEMENT

While electronic communication has the benefit of speed and access, the best form of human communication remains face-to-face. This is particularly the case during a crisis. With the operational and practical pressures of a crisis limiting time and resources for sitting and talking with people, the Board endorses the view held by its two communications experts that key departments and agencies involved in such a crisis should consider the inclusion of community relations specialists in their communications teams. These specialists can be deployed during an emergency or disaster to work with local communities, including previously identified trusted networks, in accessing and interpreting information and acting as an interface between communities and the providers of information and services.[126] In the Board's view, identifying and training community relations specialists well before an emergency or crisis occurs, is essential.

Much of the frustration the community was experiencing was a result of one-way communication, with government authorities and agencies doing much of the telling and talking and not enough listening and local engagement. The information being delivered was often not being received because it was not addressing the specific needs and concerns of the audience—the Latrobe Valley community. While distributing considerable amounts of information to the community, government departments and agencies did not engage to any significant extent in listening to, or partnering with local residents and community groups, which are identified as important strategies in best practice risk and crisis communication.[127] Had this been done soon after the Hazelwood mine fire started, a better understanding of the psychological, cultural, social and physical needs of residents may have been achieved. Local networks could also have been engaged in the task of distributing information.

While many government agencies and authorities provided factual information, the Board accepts the opinion of its two communications experts that the basic human need for empathy, and expressions of concern, care and assurance, were not adequately expressed. Communication was mostly functional, with information packaged in neatly designed templates.

Crisis communication needs to take into account the psychological, sociological and cultural aspects of human communication and these elements were largely overlooked throughout the event.

A good deal of information provided to the community during the Hazelwood mine fire by the State and its agencies did not meet best practice standards in crisis communication, which, in its simplest terms, requires quick, consistent, open and empathetic public communication. As stated by the Latrobe City Council in its written submission to the Board:

> There was a wide array of agencies providing messages to the community from their respective departments but it appeared that at times this was not coordinated or consistent in its approach. Council believes that this created confusion, fear, anger and a lack of trust within the community.[128]

These shortcomings were acknowledged by many, including the Chief Health Officer: 'The community has fed back to us that some people did not hear the messages, some people did not understand the messages, so we need to go back and do a thorough review of our communication strategy…'[129] The Board commends this review as appropriate in the circumstances.

What did work well was face-to-face communications. The clear message from the community received through community consultations, public submissions and evidence provided by community witnesses during the public hearing was that personal, face-to-face contact and open and honest information through community meetings and a door-knock was greatly valued.

EMERGENCY SERVICES

The Board commends the Fire Services Commissioner, the CFA and other emergency services for their communication with the community during the Hazelwood mine fire. It is unfortunate that other government agencies and authorities were unable to connect and deliver important information and messaging in the way both the Fire Services Commissioner and the CFA did.

The effectiveness of emergency services communication was due in part to the established regard and respect for the CFA. The Board commends the Fire Services Commissioner for effectively engaging with the community, and for his ability to engender trust and support, and genuinely convey empathy while commanding authority.

Although community meetings were integral to the effectiveness of the emergency services' communications during the mine fire, the community meeting held on 18 February 2014 was an exception. In light of the terrible conditions in Morwell over the weekend of 15 and 16 February 2014, more care should have been taken to set up the meeting in accordance with the guidelines for community meetings previously established by the State Emergency Management Team. In particular, the Board considers that this meeting should have been chaired by a skilled and experienced facilitator and attended by senior government agency representatives able to provide authoritative factual information, and to hear the messages and experiences the community were going through.

The only criticism that Professor Macnamara could level at the CFA in his analysis was an over-reliance on web-based information. In the case of the Morwell community, printed hard copies of key fact sheets, and updates would have been a useful addition to its public communication for residents who are not internet and social media users.

THE DEPARTMENT OF HEALTH AND THE ENVIRONMENT PROTECTION AUTHORITY

The Department of Health and the EPA could have been more open and transparent with the public on the development of the Carbon Monoxide Response Protocol and the $PM_{2.5}$ Health Protection Protocol as discussed in Chapter 4.6 Health response. Community trust could have been enhanced by sharing the outcomes of the peer reviews sought from a number of external experts on these important matters.

Sharing this information with the public would have helped in explaining the rationale behind their decision-making and could have helped build community trust and confidence by raising awareness and understanding that the opinions of eminently qualified experts were being sought, and what their advice was.

In a press conference on 26 February 2014, the Chief Health Officer stated that interstate and international experts were being consulted.

However, when asked by the community 'Who are you consulting?' the response was 'I don't want to disclose details of that.'[130] This was in stark contrast to the messaging of the Fire Services Commissioner, who was open about consulting experts.[131]

On the evidence, the Board considers that the Chief Health Officer, as the Government spokesperson for health, did not communicate effectively enough with the Latrobe Valley community. The Board acknowledges that many in the community perceived the Chief Health Officer's communications as lacking in empathy and sincerity. The Board appreciates that there may have been a number of other factors contributing to this, including a level of pre-existing distrust in government in the region. However, the Board does not consider that this distrust accounts for the perceived inadequacy of communication by government agencies and their spokespeople during the Hazelwood mine fire.

The Board acknowledges that the EPA was faced with the challenging task of effectively communicating complex scientific information to a diverse audience who wanted immediate data while also wanting to know what it meant for their health. In particular, in an effort to address this demand, the EPA experienced criticism following the launch and promotion of its microsite for the mine fire on 21 February 2014. The microsite was difficult to access for some and increased expectations, whereby the community sought even more interpretation and advice relating to the information posted.[132]

In trying to understand complex issues such as various types of air pollution, many members of the community who do not have a science background (the majority) required explanation, discussion and a chance to ask questions and clarify information. Effective communication often requires face-to-face meetings and printed information sheets that can be retained and referred to as required.[133] It was poor communication practice by the EPA to publish information sheets that posed, but provided no meaningful answers, or unclear answers, to pressing public health questions.

Additional efforts by EPA staff on the ground to provide face-to-face communication with the community during the event is commended by the Board, although the success of this strategy appeared to be limited from the community's perspective.

The bushfire smoke advisories issued by the EPA and the Chief Health Officer throughout the fire were repetitive, poorly focused and unhelpful, increasingly so as the weeks went by. The bushfire smoke advisories originated from the 2009 Black Saturday Bushfires and are template-based documents that exist based on an agreement between the EPA and the Department of Health. They were not seen as helpful during the Hazelwood mine fire, particularly as the fire burned beyond the first week.

The Board accepts the view of its communications experts that the advice should have been better tailored to the actual conditions in and around Morwell and the prolonged nature of the fire. Communication during a crisis needs to be simple, clear and meaningful, using plain language that avoids jargon and acronyms. However, it should not be repetitive or based solely on pre-approved templates only.

Smoke alerts did not provide any information about levels of sulphur dioxide, carbon monoxide, or other chemical or particle pollutants. The EPA distributed only general information about smoke and notification that it was testing the air quality.

While the Board endorses the use of social media as an important channel for fast communication with internet-connected and social media savvy citizens, there was an over-reliance on internet communications during the crisis by the EPA.

LATROBE CITY COUNCIL

The Board recognises that Latrobe City Council was placed in a difficult position due to the way communication was dealt with by government agencies and authorities. However, the Council could have improved its online and social media presence to help clarify its role with the community.

The Council's clean up package became symbolic of the inadequacy of Council to communicate effectively with the community.

The Board commends the Council for undertaking a door knock of the entire town of Morwell. In seeking to communicate in person, to ensure people knew what was happening and to find out how people were, some 6,400 homes were attended. This would have been even more valuable had it been done earlier. The Board acknowledges the resource constraints the Council was working under and commends the efforts of those from Councils as far away as Ararat who volunteered their time to assist with this door knock.

GDF SUEZ

During the 45 days that the Hazelwood mine fire burned, GDF Suez's communications practices fell well short of good communication standards.

The Board accepts the views of the independent communications experts in relation to GDF Suez. In particular, the Board agrees that GDF Suez was 'conspicuous by its absence' regarding public communication throughout the crisis. This included a noticeable absence by GDF Suez at community meetings and media conferences.

International best practice in crisis communication demonstrates that the central company involved in an emergency should be open, honest, quick to respond and act responsibly. GDF Suez did not adopt this approach. GDF Suez did not publicly express its concern other than in a few paid advertisements in the Latrobe Valley Express. The consequence was that the community saw the mine owner and operator as failing it.

The Board considers that adhering to the 'one source, one message' policy of government did not preclude GDF Suez from expressing compassion and empathy by having a physical presence at community engagement meetings and press conferences, or otherwise showing its compassion and concern for the community and the impact the fire had.

The Board considers that GDF Suez in particular, needs to review its crisis communication approach and demonstrate greater concern for the local communities in which it operates and directly affects. The Board affirms the commitment articulated by Mr Steven Harkins, GDF Suez Director of People, Culture and Environment, and Mr George Graham, GDF Suez Asset Manager, to review the GDF Suez communications protocol. The protocol should ensure that during the response to an incident that is capable of impacting on the community, GDF Suez is able to communicate messages to the community effectively.

COMMUNITY-BASED COMMUNICATIONS

The Board commends those from Morwell Neighbourhood House, the Ramahyuck District Aboriginal Corporation, Asbestos Council of Victoria and Gippsland Asbestos Related Diseases Support Inc., and other community organisations for their efforts in keeping their community as informed and connected as they could under the circumstances.

The Board commends those responsible for the establishment of Voices of the Valley and the actions of this group in disseminating important information to the local community and advocating on their behalf during the emergency.

As well as providing a voice for the community, the formation of Voices of the Valley illustrates the importance of self-help and agency. It also emphasises the important role a community group like this can play not only in advocating on behalf of others but in the potential to partner with government authorities to support effective crisis communication with the community.

OPPORTUNITIES FOR ENHANCEMENT

The Board notes the communication principles included in the Victorian Emergency Management Reform White Paper and the Victorian Government's new governance arrangements for emergency management in Victoria through Emergency Management Victoria. The Board commends action taken to improve how agencies communicate with communities in emergency situations.

The Board considers that the issues raised by this Inquiry and the recommendations of this report should be reflected in crisis communication policy and procedures within the new emergency management framework. The Board considers that government agencies consider the suggestions for improvement, and that GDF Suez review its crisis communications approach to more effectively engage with the community.

RECOMMENDATION 11

The State review and revise its communication strategy to:

- ensure all emergency response agencies have, or have access to, the capability and resources needed for effective and rapid public communications during an emergency; and
- ensure, where appropriate, that private operators of essential infrastructure are included in the coordination of public communications during an emergency concerning that infrastructure.

RECOMMENDATION 12

The State, led by Emergency Management Victoria, develop a community engagement model for emergency management to ensure all State agencies and local governments engage with communities and already identified trusted networks as an integral component of emergency management planning.

RECOMMENDATION 18

GDF Suez improve its crisis management communication strategy for the Hazelwood mine in line with international best practice.

1. Exhibit 50 – Expert report of James Macnamara, p. 7
2. Exhibit 50 – Expert report of James Macnamara, p. 8
3. Exhibit 50 – Expert report of James Macnamara, p. 8
4. Macnamara T1272:14-28
5. Macnamara T1272:23-28
6. Drummond T1273:22-31; T1274:1-5
7. International Federation of Red Cross and Red Crescent Societies n.d., *Types of disasters: Definition of hazard*, IFRC, Switzerland, viewed 25 July 2014, https://www.ifrc.org/en/what-we-do/disaster-management/about-disasters/definition-of-hazard/
8. Exhibit 50 – Expert report of James Macnamara, p. 9
9. Drummond & McNamara T1302:3-16
10. Macnamara T1302:8-14
11. Drummond T1302:15-16
12. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.5.2
13. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.5.3
14. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.5.3
15. Drummond T1278:11-21
16. Tabain T1388:15 – T1389:9
17. Exhibit 1 – Statement of Craig Lapsley, para. 171
18. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.3.4
19. Lapsley T94:2-15
20. Drummond T1297:23-27
21. Drummond T1298:9-11; T1298:19-22
22. Macnamara T1290:11 – T1291:30
23. Macnamara T1291:22
24. Exhibit 50 – Expert report of James Macnamara, pp. 23 & 24
25. Exhibit 50 – Expert report of James Macnamara, p. 21
26. Exhibit 50 – Expert report of James Macnamara, p. 21
27. Exhibit 51 – Expert report of Lachlan Drummond, p. 34, recommendation 6
28. Drummond T1282:5-16
29. Macnamara T1282:25-30; T1282:2-6; T1283:29-30
30. Exhibit 53 – Statement of Merita Tabain, para. 56
31. Exhibit 53 – Statement of Merita Tabain, para. 18
32. Exhibit 53 – Statement of Merita Tabain, para. 57; Tabain T1363:9-18
33. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.4
34. Adapted from Exhibit 96 – Hazelwood Coal Mine Fire Operational Communications Structure
35. Exhibit 53 – Statement of Merita Tabain, para. 88
36. Exhibit 1 – Statement of Craig Lapsley, para. 164
37. Exhibit 1 – Statement of Craig Lapsley, para. 168
38. Tabain T1390:27 – T391:7
39. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.6
40. Lapsley T99:25-28
41. Macnamara T1359:15-23
42. Lapsley T100:13-21
43. Lapsley T99:20 – T100:8
44. Exhibit 46 – Statement of Rosemary Lester, attachment 18
45. Exhibit 1 – Statement of Craig Lapsley, paras 146-169
46. Exhibit 1 – Statement of Craig Lapsley, para. 161
47. Exhibit 36 – Statement of Nicholas Pole, attachment 42
48. Lapsley T62:21-23
49. Exhibit 53 – Statement of Merita Tabain, paras 110 & 111
50. Tabain T1400:15-21
51. Exhibit 1 – Statement of Craig Lapsley, para. 166
52. Lapsley T96:2-8
53. Tabain T1398:12 – T1340:4
54. Exhibit 56 – Statement of Alan Hall, para. 182; Exhibit 55 – Statement of John Mitchell, para. 44
55. Tabain T1396:1-27
56. Written submission of Ron Ipsen
57. Community consultation, Kernot Hall, Morwell, 10 April 2014, 12.30 pm
58. Drummond T1277:24-31

59. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.6.2
60. Adapted from Exhibit 51 – Expert report of Lachlan Drummond, exhibit 3 (adapted to correct errors in dates)
61. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.3.11
62. Exhibit 46 – Statement of Rosemary Lester, attachment 19
63. Exhibit 32 – Statement of John Merritt, appendix 4, High Level Smoke Advisory - Latrobe Valley 0900 Friday 28 February 2014 (EPA.0001.001.0035)
64. Lund T771:7-20
65. Drummond T1284:15-19
66. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.3.10
67. Community consultation, Kernot Hall, Morwell, 10 April 2014, 6 pm; Community consultation, Federation University Auditorium, Churchill, 11 April 2014, 1.30 pm
68. Exhibit 53 – Statement of Merita Tabain, paras 89 & 90
69. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.2.6; Written submission of Susan Dietrich
70. Exhibit 50 – Expert report of James Macnamara, pp. 30 & 31; Exhibit 30 – Statement of Tracie Lund, para. 20
71. Exhibit 50 – Expert report of James Macnamara, pp. 30 & 31
72. Written submission of Pat Bartholomuez
73. Exhibit 43 – Statement of Vicki Hamilton, para. 13
74. Exhibit 43 – Statement of Vicki Hamilton, para. 14
75. Wilson T1947:19-27
76. Exhibit 49 – Statement of Annette Wheatland, para. 26
77. Brook T1099:5-25
78. Exhibit 30 – Statement of Tracie Lund, para. 25
79. Lund T767:22-31; Hall T1497:6-17; Written submission of Kylie Stockdale
80. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.4.2
81. Exhibit 50 – Expert report of James Macnamara, p. 35
82. Exhibit 32 – Statement of John Merritt, para. 50
83. Exhibit 51 – Expert report of Lachlan Drummond, para 6.3.7
84. Tabain T1407:19 – T1408:10
85. Exhibit 32 – Statement of John Merritt, appendix 3; Peer Reviews of the EPA Victoria Response to the Morwell Coal Fire Air Quality Assessment and Monitoring Programs (EPA.0001.007.0010)
86. Exhibit 32 – Statement of John Merritt, appendix 3; Peer Reviews of the EPA Victoria Response to the Morwell Coal Fire Air Quality Assessment and Monitoring Programs (EPA.0001.007.0010)
87. Exhibit 54 – Statement of Brooke Burke, paras 27 & 30
88. Burke T1371:14-20
89. Exhibit 32 – Statement of John Merritt, appendix 3; Peer Reviews of the EPA Victoria Response to the Morwell Coal Fire Air Quality Assessment and Monitoring Programs (EPA.0001.007.0010)
90. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.4.4
91. Exhibit 50 – Expert report of James Macnamara, p. 41
92. Exhibit 50 – Expert report of James Macnamara, p. 41
93. Written submission of the Latrobe City Council
94. Written submission of the Latrobe City Council
95. Written submission of the Latrobe City Council
96. Exhibit 71 – Statement of Robert Jackman, para. 22
97. Exhibit 54 – Statement of Brooke Burke, para.14
98. Exhibit 55 – Statement of John Mitchell, para. 97
99. Exhibit 50 – Expert report of Lachlan Drummond, para. 6.4.4
100. Exhibit 50 – Expert report of Lachlan Drummond, para. 6.4.5
101. Ellis T892:28; T893:20
102. Exhibit 50 – Expert report of James Macnamara, pp. 42-45
103. Exhibit 50 – Expert report of James Macnamara, p. 44
104. Exhibit 50 – Expert report of James Macnamara, p. 43
105. Exhibit 50 – Expert report of James Macnamara, p. 45
106. Harkins T1547:9-27
107. Exhibit 30 – Statement of Tracie Lund, paras 4, 10-11 & 14
108. Lund T:767:9
109. Exhibit 30 – Statement of Tracie Lund, paras 22 & 23
110. Andrew T1522:12-18; Exhibit 57 – Statement of Karen Andrew, para. 8
111. Andrew T1522:19-31; Exhibit 57 – Statement of Karen Andrew, para. 31
112. Exhibit 57 – Statement of Karen Andrew, para. 35
113. Andrew T1528:16-28

114. Written submission of Deafaccess Gippsland
115. Exhibit 35 – Statement of Simon Ellis, paras 36 & 41-52
116. The only community consultations where the ABC was not mentioned in feedback were: Community consultation, Morwell Bowling Club, Morwell, 16 April 2014, 7 am; Multicultural Community consultation, 20 Hazelwood Road, Morwell, 7 May 2014, 4 pm
117. Lapsley T61:8-12
118. Tabain T1393:12-19
119. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.3.1
120. Exhibit 52 – Joint report of James Macnamara and Lachlan Drummond, p. 2
121. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.3.1
122. Exhibit 50 – Expert report of James Macnamara, p. 5
123. Exhibit 51 – Expert report of Lachlan Drummond, para. 6.2.2
124. Macnamara T1292:1-17
125. Exhibit 50 – Expert report of James Macnamara, p. 5
126. Exhibit 52 – Joint report of James Macnamara and Lachlan Drummond, p. 3
127. Exhibit 50 – Expert report of James Macnamara, p. 6
128. Written submission of the Latrobe City Council, p. 8
129. Lester T1200:12-18
130. Hazelwood mine fire media conference 2014, reported across all mediums, Traralgon, 26 February 2014, media conference with Dr Rosemary Lester, Mr Craig Lapsley and Mr John Merritt , viewed 3 August 2014, http://www.youtube.com/watch?v=Gg58UUY_d58
131. Stavropoulos, P 2014, 'Crews battling Hazelwood open cut mine fire use 'balancing' act to avoid the potential of flooding and damage', *ABC News Online*, 19 February 2014 , viewed 3 August 2014, http://www.abc.net.au/news/2014-02-19/crews-battling-hazelwood-open-cut-mine-fire-facing-challenges/5270470
132. Written submission of the Victorian Government, 22 May 2014 para. 9.92
133. Exhibit 50 – Expert report of James Macnamara, p. 37

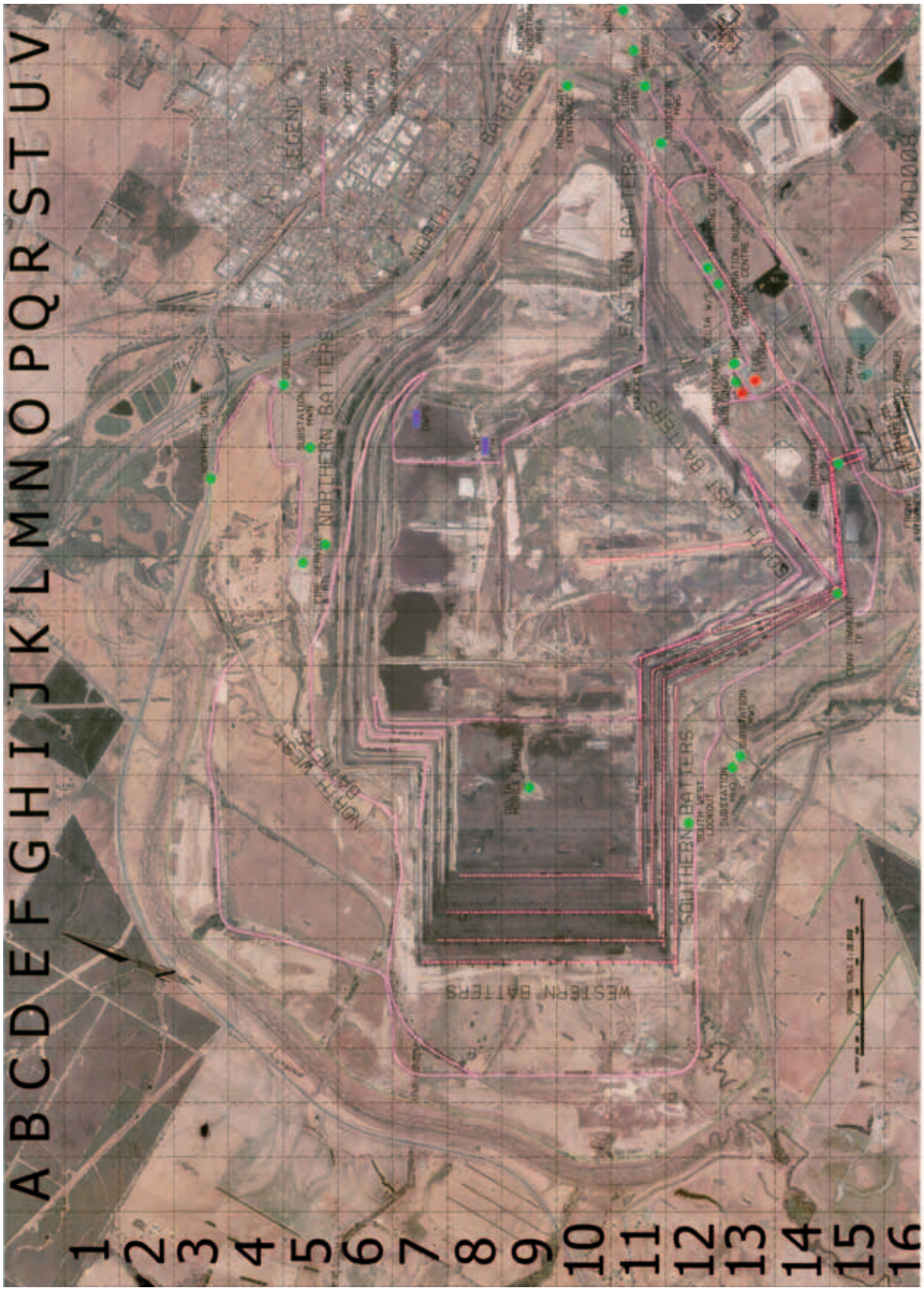
Image source *Fairfax Syndication*

APPENDIXES

Appendix A Aerial map of Morwell
Appendix B Grid of mine
Appendix C Inquiry personnel
Appendix D Witnesses
Appendix E Individual submissions
Appendix F Organisation submissions
Appendix G Submissions made through Environment Victoria

APPENDIX A AERIAL MAP OF MORWELL

APPENDIX B GRID OF MINE



APPENDIX C INQUIRY PERSONNEL

The following people were engaged to assist the Inquiry during its various phases.

Family name	First name	Position
Crook	Rebecca	Senior Paralegal
Harrison	Hayley	Administrative Assistant
Hauraki	Rawinia	Stenographer
Hay	Sally	Office Manager
Horsfield	Sam	Editor
Kolyunski	Lana	Community Engagement Manager
Lanyon, Dr	Elizabeth	Head of Secretariat
Matters	Tracey	Media and Communications Manager
Meade	Stephen	Senior Legal Adviser
McLaughlin	Daniel	Assistant Transcriber
Mitchell	Brooke	Principal Adviser
Pascoe	Laura	Legal Adviser
Pieris	Gregory	Legal Adviser
Richards SC	Melinda	Counsel Assisting
Rozen	Peter	Counsel Assisting
Skelley	Miranda	Legal Adviser
Stansen	Justine	Principal Legal Adviser
Wallace	Joanne	Policy Adviser

Note: Only those individuals who worked with the Inquiry for two weeks or more are listed.

APPENDIX D WITNESSES

The table below lists the witnesses who appeared before the Inquiry. Some witnesses appeared more than once.

Title	Name	Role
Ms	ANDREW, Karen	Community witness; Youth Suicide Prevention Counsellor, Ramahyuck District Aboriginal Corporation
Mr	BARRY, Robert	Incident Controller and Regional Director for Barwon South West Region, Country Fire Authority
Dr	BROOK, Christopher	State Health and Medical Commander and Chief Adviser on Innovation, Safety and Quality, Department of Health
Mr	BROWN, William	Community witness; former Fire Services Officer at the Hazelwood Mine
Ms	BURKE, Brooke	Community witness; Morwell Business Owner
Prof.	CAMPBELL, Donald	Expert witness; Professor of Medicine, Southern Clinical School, Monash University and Program Director, General Medicine Program, Monash Health
Prof.	CLIFF, David	Expert witness; Professor of Occupational Health and Safety in the Minerals Industry and Director, Minerals Industry Safety and Health Centre, University of Queensland
Mr	DRUMMOND, Lachlan	Expert witness; Consultant, Research and Strategy Lead, Redhanded Communications
Mr	DUGAN, Robert	Mine Production Manager, Hazelwood Power Corporation Pty Ltd
Mr	ELLIS, Simon	Community witness; former President of Voices of the Valley
Mr	FAITHFUL, James	Technical Services Manager - Mine, Hazelwood Power Corporation Pty Ltd
Mr	FRESHWATER, Graeme	Community witness; former Mine Manager at the Hazelwood Mine
Mr	GAULTON, Robert	Community witness; former Mine Geologist with the Hazelwood Mine
Mr	GRAHAM, George	Asset Manager, Hazelwood Power Corporation Pty Ltd
Mr	HALL, Alan	State Recovery Coordinator and Director Performance Regulation and Reporting, Department of Human Services
Ms	HAMILTON, Vicki	Community witness; Chief Executive Officer and Secretary, Asbestos Council of Victoria and Gippsland Asbestos Related Diseases Support Inc.
Mr	HARKINS, Steven	Director, People, Culture and Environment, Hazelwood Power Corporation Pty Ltd
Mr	HAYES, Kevin	Field Subject Matter Expert and Workplace Inspector, Earth Resources Unit, Victorian WorkCover Authority
Mr	HAYNES, John	Incident Controller and Deputy Chief Officer, Country Fire Authority
Mr	INCOLL, Roderic	Expert witness; Bushfire Risk Consultant
Mr	JACKMAN, Robert	Community witness; Morwell resident
Mr	JEREMIAH, Lawrence	Incident Controller and Regional Business Manager, Department of Environment and Primary Industries
Mr	KATSIKIS, Costa	Deputy Incident Controller and HazMat Unit Commander, Metropolitan Fire and Emergency Services Board

Mr	BLOINK, Simon	Incident Controller and Operations Officer, Country Fire Authority
Mr	FOSS, Barry	Incident Controller and Operations Manger, Country Fire Authority
Mr	KELLY, Robert	Manager, Earth Resources Unit, Victorian WorkCover Authority
Mr	KING, Lance	Coordinator of Emergency Management, Latrobe City Council
Mr	LALOR, Anthony	Community witness; Country Fire Authority Volunteer
Mr	LAPSLEY, Craig	Fire Services Commissioner, Fire Services Commission
Dr	LESTER, Rosemary	Chief Health Officer, Department of Health
Ms	LUND, Tracie	Community witness; Morwell Neighbourhood House Coordinator
Prof.	MACNAMARA, James	Expert witness; Professor of Public Communication, University of Technology, Sydney
Mr	MAUGER, James	1x7 Operator, Hazelwood Power Corporation Pty Ltd
Mr	MERRITT, John	former Chief Executive Officer, Environment Protection Authority
Mr	MITCHELL, John	Acting Chief Executive Officer, Latrobe City Council
Mr	NEIST, Leonard	Executive Director, Health and Safety, Victorian WorkCover Authority
Mr	NORRIS, Jaymie	Acting Manager, Strategic Bushfire Risk Assessment Unit, Department of Environment and Primary Industries
Mr	POLE, Nicholas	Deputy Secretary, Regional Services Group, Department of Education and Early Childhood Development
Mr	POLMEAR, Richard	Carbon Efficiency and Improvement General Manager, Hazelwood Power Corporation Pty Ltd
Mr	PREZIOSO, Romeo	Senior Mine Planner, Hazelwood Power Corporation Pty Ltd
Mr	PULLMAN, Jason	Coordinator of Strategic Planning, Latrobe City Council
Ms	RICHARDSON, Claire	Expert witness; Managing Director and Principal Consultant, Air Noise Environment Pty Ltd
Mr	ROACH, Alan	Security and Emergency Services Manager, Hazelwood Power Corporation Pty Ltd
Mr	ROBERTS, Michael	Detective Inspector, Victoria Police and Officer in Charge of the Arson & Explosives Squad
Mr	STELEY, Doug	Community witness; Country Fire Authority Volunteer
Mr	SHANAHAN, David	Services Superintendent, Hazelwood Power Corporation Pty Ltd
Mr	SULLIVAN, Ross	Incident Controller and Operations Manger, Country Fire Authority

Ms	TABAIN, Merita	Chair, Emergency Management Joint Public Information Committee and Director, Media and Corporate Communications, Victoria Police
Dr	TORRE, Paul	Science Officer and Team Leader, Analysis and Predictions, Environment Protection Authority
Mr	WARRINGTON, Steven	Incident Controller and Deputy Chief Officer – Emergency Management, Country Fire Authority
Mr	WATSON, Adam	Manager of Investigation, Enforcement Group, WorkCover Authority
Ms	WHEATLAND, Annette	Community witness; Gippsland Regional Manager, Southern Cross Care Victoria
Ms	WHITE, Kylie	Executive Director, Earth Resources Regulation Branch, Department of State Development, Business and Innovation
Mr	WHITTAKER, Ray	Community witness; Morwell resident
Ms	WILSON, Lisa	Community witness; Gippsland Homeless Network Coordinator, Quantum

APPENDIX E INDIVIDUAL SUBMISSIONS

ANDREW, Karen
ARROW, Kaleb
BARFOOT, Jennifer
BARTHOLOMEUSZ, Pat
BEECHER KELK, Noah
BENEDETTI, Maria
BERKOVICS, Gerald
BLANEY, Martina
BOOTHMAN, Carolyne
BREWER, Olivia
BROWELL, Julia
BROWN, Julie
BROWN, William
BURNS, Fred
CABION, Tracy
CAFFREY, Daniel
CASSON, Avenel
CHAPMAN, Paul
CHARLESWORTH, Elizabeth
CLELAND, Brendon
COLLINS, Margaret
COOK, Margaret
COUSIN, Rosemary
CRAWFORD, Graeme
DALTON, Mark
DAVIS, George
DI NATALE, Richard
DIETRICH, Shaun
DIETRICH, Susan
DOWLING, John
DRAEGER, Ron
ELLINGHAM, John
ELLIS, Simon
FARMER, Naomi
FARMER, Wendy
FLINT, Brien
FRESHWATER, Graeme
GAULTON, Rob
GEDDES, Darren
GILES, Greg
GITTOS, Craig
GLEESON, Regina
GUNTER, Michael
HAMILTON, Christine
HARRISON, John
HEPBURN, Samantha
HIGGINS, Barry
HOLLIS, David
HOWES, James
INCOLL, Roderic
IPSEN, Ron
JACKEULEN, Jenny
JENKINS, Brendan
JOHN, Antony
JONES, Roger
JORDAN, Tessie
KAUFMAN, Ann
KENTSCH, Averil
LAIRD, Andrew
LALOR, Anthony
LANGMORE, David
LEE, John
LILEY, Alicia
LLOYD, Rodney
LORD, Chris
MAGUIRE, Brenda
MARGARET, Gayle
MARINO, Antonio
MARINO, Maria
MARINO, Vince
MASON, David
McCUBBIN, Joanna
McKELVIE, Malcolm
McKENZIE-McHARG, Victoria
McKERNAN, Michael
MIDDLEMISS, Graeme
MORAHAN, Jacinta
O'BRIEN, Michael
OHLSON, Kelly
PARNABY, Rose
PAUL, Marjorie
PAYETTE, Rita
PETERS, Susan
POPPINS, John
QUIRK, Elaine
REID, David
ROBINSON, Miriam
SANDS, Wendy
SESTOKAS, Leah
SINDT, Christine
SLUGA, Sheree
STEERS, Jolanta
STELEY, Doug
STOCKDALE, Kylie
TARANTO, Giuseppe
TEMPLE, Robert
THOMAS, Max
THOMPSON, Catheryn
TYLEE, Don
TOSPELL, Sue
WALL, Kerryn
WALTON, Jennifer
WEBB, Debra
WIGG, Rosemary
WILLIAMS, Howard
WILSON, Lisa
YELDS, Robert

In addition to the public submissions listed above, the Hazelwood Mine Fire Inquiry received a number of confidential submissions.

APPENDIX F ORGANISATION SUBMISSIONS

Advance Morwell Inc

Asbestos Council of Victoria

Australasian Fire and Emergency Service Authorities Council

Australian Char Pty Ltd

Australian Medical Students' Association

Australian Nursing and Midwifery Federation (Victorian Branch)

Clean Air Society of Australia and New Zealand

Clean Air Tas

Communist Party of Australia

Community Over Mining

Construction, Forestry, Mining and Energy Union (Mining and Energy Division)

Deafaccess Gippsland – Victorian Deaf Society

Deanmac Emergency Services Pty Ltd

Doctors for the Environment Australia

Environment Victoria

Environmental Justice Australia

Friends of Latrobe City Libraries

Gippsland Resources Group

Latrobe City Council

Latrobe Valley Sustainability Group

Ratepayers Victoria (Inc)

Southern Cross Care Victoria (Gippsland)

Tyrecycle Pty Ltd

United Firefighters Union

Victorian Council of Social Service

Victorian Equal Opportunity and Human Rights Commission

Victorian Government

Virtual Operations Support Team Victoria

Voices of the Valley

Volunteer Fire Brigades Victoria

APPENDIX G SUBMISSIONS MADE THROUGH ENVIRONMENT VICTORIA

ALDERWICK, Kath
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AZLIN, Pam
BADGER, Tiarni
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BAGUANT-ROBINSON, Luke
BAKER, Chris
BAKOPANOS, Melinda
BANJANIN, Mariana
BARKER, Amanda
BARRINGTON, Valerie
BARRY, Glenn
BEAVIS, Margaret
BELL, Doug
BENDALL, Lauren
BIGNELL, Nicholas
BLOMFIELD, Janet
BLOOMFIELD, John
BOWEN, Sandy
BOYD, Jolie
BOYD, Ian
BRADLEY, Jennifer
BRADLEY, Lucie
BRAKHA, Sally
BRIODY, Rebecca
BROOKES, Laura
BROWN, James
BROWN, Roger
BRUCE, Leanne
BUCHER, Haydn
BURGUNDER, Stanley Mark
BURNS, Mark
BURTON, Sean
BYRNES, Chris
CADUSCH, Matt
CAFFREY, Daniel
CAMILLERI, Eddie
CARBERRY, Joy
CHAPMAN, Judy
CHESTER, Leonie
CHRISTIE, Jean
COLLINS, Toby
CORAM, Malcolm
CRIPPS, Georgie
CROMBIE, Diana
CROSSER, Ingrid
CUTTLER, Paul
DAL CASTELLO, Linda
DALTON, Mark
DART, Peter
DAVIES, Pagan
DAY, York
DAY, Helen
DE FIGUEIREDO, John
DE ROACH, David
DE WEAVER, Lynne
DEAN, Nicholas
DELAND, Donna
DEVIESSEUX, Shirley
DEVINE, Juli
DEWAR, Steve
DIAZ, Raquel
DORN, Alison
DORN, Edward
DUBSKY, Lisl
DUNNICLIFF-WELLS, Nicola
DUROVIC, Mirjana
EDNEY, Annie
ELISE, Kari
ELLISON, Kerrie
ERWIN, Robyn
FABIAN, Kathryn
FARMER, Wendy
FENTY, Emma
FINDLAY, Lorraine
FLETCHER, Dhugal
FOY, Anthony
GARDNER, Robin
GEORGE, Peter
GLAISHER, Rosemary
GLOVER, Daniel
GOSTELOW, Anne
GREENWELL, Keith
GRIBBEN, Katharine
GRICE, Malcolm
GROSSER, Simon
GUERIN, Roma
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GWOSDEZKI, Sonja
HAMMILL, Denise
HARKER, Jim
HARRIS, Deborah
HARRIS, Paul
HARRIS, Raquel
HARRIS, Shuwei
HARRISS, Vicki
HARTNEY, Thomas
HAYDON, Belinda
HEADLAM, Freya
HENDER, Margaret
HENRY, Rocky
HICKS, David
HILL, John
HOBBS, Leanne
HOCKHING, Christine
HOLIAN, Lynne
HOLLIS, David
HOLLIS, Deborah
HOWARD, Kate
HOWARD, Monique
HOWARD, Helen
HOWES, Elizabeth
HUGHES, David
HUTCHINSON, Tanya
IVANOFF, Nick
JACOBI, Lynden
JAMES, Margaret
JORDAN, Jean
KARDARAS, Georgia
KAYE, Kim
KELLY, Tamsin
KENTWELL, Hamish
KING, Dave
KIZINSKA, Rose
KMET, Julie
KOLIHA, Jerry
KOUVARAS, Linda
LAMBIE, Colin
LANGAN, Kellie
LANGE, Margaret
LANGFOR , Robyn
LAVERY, Simon
LAW, Samantha
LAWTON, Diane
LAZARIS, Toula
LEAHY, Alison

LEENAERTS, Alan
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LEWIS, Wendy
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LITTLE, Michael
LOKE, Fong
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MADDOCK, Glenn
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MILNE, Amelia
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MOON, Jeffrey
MORAN, Karen
MORRIS, Rohan
MUNRO, Fiona
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OWERS, Garry
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PETERSON, Luke
PETTERSON, Michelle
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PLARRE, Bronwyn
POWELL, Elizabeth
PROEBSTING, Irene
PROUDLEY, Kaye
PROUDLEY, Roy
PUGSLEY, Benjamin
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RICE, Nigel
ROBBINS, Jan
ROBERTS, Nigel
RODDA, Alexandra
ROLFE, Joanne
ROSS, Neil
ROWE, Colleen
ROWE, Joan
ROWLANDS, Sharron
RUSSELL, Morgana
RUTKOWSKI, Ludmila
RYAN, Catherine
SAUNDERS, Wayne
SEAL, John
SEAL, Bronwen
SETIAWAN, Marco
SHANKLAND, Janine
SHERIDAN, Tristarnya
SHIELD, Logan
SIEGRIST, Elisabeth
SLAVIN, Patrick
SMERALDO, Aurelia
SMITH, Daniel
SMITH, Maxwell
SMITH, Vivien
SMYRK, Katherine
SNAPE AM, Brian
SOMERVILLE, Sienna
STEWART, Robyn
STRANGER, James
STRICKLAND, Peter
STROUD, Simon
STUDD, Kerri
SWEENEY, Graeme
TASOMINOS, Nicolette
TAYLOR, Sally
TEH, Jonathan
THOMSON, Craig
TIMPE, Thomas
TOMKINS, David
TRONNBERG, Fredrik
TURNER, John
UPTON, Cait
VACAREZ, Paola
VAN DER VELDEN, Jason
VAN MOORST, Harry
VANHERPEN, Jane
VUILLERMIN, Lesley
WADSWORTH, Paul
WEIS, Bob
WETHERELL, Sue
WHITEOAK, Lois
WALSH, Elizabeth
WALSH, Laurie
WALTON, Joyce
WARD, Lyndel
WEARING-SMITH, Julie
WILCOX, Sidney
WINGROVE, Greta
WORRALL, Judith
ZANDONA, Lisa

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SHORTENED FORMS, GLOSSARY AND BIBLIOGRAPHY

SHORTENED FORMS

Acronym	Contractions
ABC	Australian Broadcasting Corporation
ABS	Australian Bureau of Statistics
AEGL	Acute Exposure Guideline Levels
AIIMS	Australasian Inter-service Incident Management System
AMS	Air Monitoring Station
AS	Australian Standard
CAFS	Compressed air foam system
CCTV	Closed circuit television
CEO	Chief Executive Officer
CFA	Country Fire Authority
CGEIG	Central Gippsland Essential Industries Group Incorporated
CO	carbon monoxide
CTD	Chronic Technological Disaster
DALY	disability adjusted life year
DEECD	Department of Education and Early Childhood Development
DEPI	Department of Environment and Primary Industries
DHS	Department of Human Services
DNRE	Department of Natural Resources and Environment
DoH	Department of Health
DPI	Department of Primary Industries
DSDBI	Department of State Development, Business and Innovation
DSE	Department of Sustainability and Environment
DTPLI	Department of Transport, Planning and Local Infrastructure
E. coli	Escherichia coli
EES	Environmental Effects Statement
EMC	Emergency Management Commissioner
EMJPIC	Emergency Management Joint Public Information Committee
EPA	Environment Protection Authority
ESLO	Emergency Services Liaison Officer
ESO1	Environmental Significance Overlay – Schedule 1 – Urban Buffer
ESV	EnergySafe Victoria
FSC	Fire Services Commissioner
HARA	Hazelwood Ash Retention Area
HazMat	Hazardous materials and items
HEPA filter	high efficiency particulate air filter
HVP	Hancock Victorian Plantations Pty Ltd
ICA	Insurance Council of Australia
LPP	Local Planning Provisions
LVAMN	Latrobe Valley Air Monitoring Network
MHF	Major Hazard Facility
MFB	Metropolitan Fire Brigade
MHO	MHO power substation
MMH	major mining hazard
MWE	Morwell East power substation

MWN	Morwell North power substation
MWW	Morwell West power substation
NAAQS	National Ambient Air Quality Standards (US)
NATA	National Association of Testing Authorities
NDRRA	Natural Disaster Relief and Recovery Arrangements
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NO_2	nitrogen dioxide
O_3	ozone
OHS	Occupational Health and Safety
OHSMS	Occupational Health and Safety Management System
PAH	polycyclic aromatic hydrocarbons
$PM_{2.5}$	particulate matter of 2.5 micrometres or less in diameter
PM_{10}	particulate matter of 10 micrometres or less in diameter
ppb	parts per billion
ppm	parts per million
SECV	State Electricity Commission Victoria
SEIFA (IRSED) Rank	Socio-Economic Indexes for Areas (Index of Relative Socio-Economic Disadvantage) Rank
SES	Victoria State Emergency Service
SMS	Safety Management System
sms	short message service
SOP	Standard Operating Procedure
SO_2	sulphur dioxide
SUZ1	Special Use Zone – Schedule 1 – Brown Coal
TFB	Total Fire Ban
$\mu g/m^3$	micrograms per cubic metre of air
UFU	United Firefighters Union
VCOSS	Victorian Council of Social Service
VECCI	Victorian Employers Chamber of Commerce and Industry
VFBV	Volunteer Fire Brigades Victoria
VicPol	Victoria Police
VOC	volatile organic compound
VPP	Victoria Planning Provisions
VWA	Victorian WorkCover Authority
WHO	World Health Organisation
YLD	years lived with a disability

LEGISLATION

Shortened form	Act
CFA Act	*Country Fire Authority Act 1958* (Vic)
Emergency Management Act	*Emergency Management Act 1986* (Vic)
Evidence Act	*Evidence (Miscellaneous Provisions) Act 1958* (Vic)
Mineral Industries Regulations	Mineral Resources (Sustainable Development) (Mineral Industries) Regulations 2013 (Vic)
Mineral Resources Act	*Mineral Resources (Sustainable Development) Act 1990* (Vic)
Mineral Resources Amendment Act	*Mineral Resources (Sustainable Development) Amendment Act 2014* (Vic)
OHS Act	*Occupational Health and Safety Act 2004* (Vic)
OHS Regulations	Occupational Health and Safety Regulations 2007 (Vic)
Planning and Environment Act	*Planning and Environment Act 1987* (Vic)
Public Health and Wellbeing Act	*Public Health and Wellbeing Act 2008* (Vic)

GLOSSARY

1 x 7 crew	A multi-skilled work-group in the Hazelwood mine that perform tasks such as fire services, earthworks and general maintenance around the mine on a seven day roster.
2 x 12 crew	The operations team at the Hazelwood mine working on day and night shifts.
Area RAE	Mobile air monitoring deployed to Morwell to monitor carbon monoxide levels.
Australasian Inter-service Incident Management System	A nationally recognised system of incident management for emergency services agencies.
batters	An area of the Hazelwood mine, also referred to as the mine wall or a section of the mine wall. The batters may refer to either the individual steeply sloping surfaces between working levels of the mine or the overall mine wall from the bottom of the mine to grass level consisting of individual batters, benches and berms.
benches	Horizontal flat surfaces created by the individual working levels.
berms	The relatively flat surfaces created in batters between working levels of the Hazelwood mine to stabilise the batter or intercept fretted material.
Black Saturday	The Victorian bushfires of Black Saturday, 7 February 2009, that caused the death of 173 people.
bunker	A structure used for the short-term storage of mined coal prior to its use in a power station or other means.
clean water pump	Water pump at the Hazelwood mine that de-waters the aquifer beneath the Hazelwood mine and conveys the artesian water to the Hazelwood pondage.
contained (fire)	The status of a fire where the spread of the fire has been halted, but it may still be burning freely within the perimeter.
containment line	A natural or constructed barrier, or treated fire edge, used in fire suppression and prescribed burning to limit the spread of fire.
control agency	The agency nominated to control the response activities for an emergency.
controlled (fire) or under control	The status of a fire where the complete perimeter of the fire is secured and no breakaway is expected.
fire season	The fire season is also known as the Fire Danger Period. The CFA declares the Fire Danger Period for each municipality (shire or council) at different times in the lead up to the fire season. The Fire Danger Period may be declared as early as October in some municipalities and typically remains in place until the fire danger lessens, which could be as late as May.
dredger	A bucket-wheel digging machine that digs coal out from the batters of the mine, and deposits the coal onto the conveyor system that carries the coal to the power station.
DustTrak	Mobile air monitoring equipment deployed to Morwell to produce indicative data for $PM_{2.5}$.
ember attack	Occurs when embers carried by the wind ignite spot fires ahead of the firefront.
embers	Burning twigs, leaves and other debris that are carried by the wind.
Emergency Warning	One of the levels of alerts used to warn the community during an emergency. The message for an Emergency Warning is, 'you will be impacted by the emergency. You are in danger and must take action immediately'. The message will usually be preceded by the Standard Emergency Warning Signal.
Fire Alert (Hazelwood mine)	A Fire Alert is declared at the Hazelwood mine when severe fire weather conditions exist. A Fire Alert triggers precautions, such as fire watch, prohibition of burning and welding, access and wetting down.
fire break	Any piece of land where fire fuel has been physically removed to create a gap between an area of uninterrupted fire fuel. The fire break may be an area of exposed earth, a sand track, a bitumen road, or a water body.
fire danger rating	The prediction of how a fire would behave if started, including how difficult it would be to put out. The higher the rating, the more dangerous the conditions.

firefront	Also called the head of the fire. A firefront is where a fire is making greatest progress (usually downwind), as measured by its forward rate of spread. Flames are tallest and the intensity of the fire is greatest at the fire front. The firefront is affected by wind direction, fuel and topography and can change as these factors change.
fireground	The area where the fire is actively burning.
fire hole	Fire holes are areas of heat within coal seams under the earth. As coal is fractious, fissures are created within the seams, allowing oxygen to reach a hot spot and ignite a fire. Fire holes occur naturally at the Hazelwood mine.
flank of the fire	Refers to the sides of the fire, as distinct from the front of the fire.
going (fire)	The status of a fire that is expanding in a certain direction or directions.
hot spot	An active part of a fire. Also used to refer to a fire hole.
hot works	Hot works at the Hazelwood mine refer to cutting, grinding or welding.
Level 1 fire incident	A small, simple fire (or group of fires) which is able to be controlled using local resources.
Level 2 fire incident	A fire that cannot be contained by the first attack of local resources.
Level 3 fire incident	A large or complex fire where resources from a range of locations are involved.
major hazard facility	A facility at which there is a potential for a major incident to occur. A major incident includes an uncontrolled incident involving fire which poses a serious and immediate risk to health and safety.
major mining hazard	Hazards that carry a significant risk of causing more than one death.
MoLab	Mobile air monitoring equipment deployed to Morwell to monitor air quality.
overburden	The clay, gravel and soil that covers coal and which is removed in the mining process.
passive samplers	A type of air sampling device. Passive samplers do not actively sample by drawing (pumping) an air stream across a sensor, but usually have a membrane or surface that interacts with the immediately adjacent air.
permanent monitoring stations	Stations managed by the EPA that monitor ambient air quality in permanent locations throughout Victoria.
operating area (Hazelwood mine)	The western batters or west field, where coal is currently being extracted.
reticulated fire services water system	Also known as the fire service network. The system consists of a pipe network which supplies water to sprays and hydrants (including tanker filling points) in the mine.
safe (fire)	The status of a fire where no further suppression action or patrols are necessary.
shelter in place	An emergency response action recommended to the community for safety purposes when the outdoor atmosphere is too toxic. Shelter in place means to take shelter indoors, to seal off windows, doors and vents, and to listen for further instructions from emergency services.
slot bunker	A central point at the Hazelwood mine where the coal is delivered from the mine and then sent onto the Hazelwood Power Station.
spot fire	Spot fires are new fires that occur ahead of the main fire. They are usually started by embers.
spotting	The ignition of spot fires from sparks and embers.
State Emergency Warning System	Or Standard Emergency Warning Signal – designed to alert the public via a media announcement that an official emergency announcement is about to be made concerning an actual or potential emergency which has the potential to affect the public.
strike team	A team of five like CFA vehicles (eg tankers) and a command vehicle, all fully crewed.
tanker filling point	An area where a mobile tanker can refill with water.
TravelBLANkET	Mobile air monitoring equipment deployed to Morwell to produce indicative data for $PM_{2.5}$ measures.
Watch and Act	One of the levels of alerts that are to warn the community during an emergency.
western batters or west field	The western area at the Hazelwood mine where coal is currently being extracted. Also known as the Operating Area.
worked out batters	Batters located in the worked out areas of the Hazelwood mine.
worked out areas	The areas within the Hazelwood mine where coal mining no longer takes place.

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