



**PART ONE**  
**INTRODUCTION**  
**TO THE INQUIRY**

## PART 1 INTRODUCTION TO THE INQUIRY

The 2014 Hazelwood Mine Fire Inquiry was held from February to September 2014. On 26 May 2015, The Honourable Lily D'Ambrosio MP, Minister for Energy and Resources, and The Honourable Jill Hennessy MP, Minister for Health, announced the re-opening of the Inquiry. The purpose of the re-opened Inquiry is to investigate and report on whether the 2014 Hazelwood mine fire contributed to an increase in deaths; measures to improve the health of the Latrobe Valley; rehabilitation options and rehabilitation bonds for Latrobe Valley coal mines; and minimising fire risks at Anglesea coal mine for the 2015–16 fire season.

### TERMS OF REFERENCE

This report addresses paragraphs 8, 9 and 10 of the Hazelwood Mine Fire Board of Inquiry's Terms of Reference. The Board is to inquire into, report on, and make any recommendations that it considers appropriate in relation to the following:

8. Short, medium and long-term options to rehabilitate:
  - a. land on which work has been, is being or may lawfully be done in accordance with a work plan approved for the Hazelwood mine, the Yallourn mine, and the Loy Yang mine
  - b. land in relation to which an application for variation of the Work Plan is under consideration for the Hazelwood mine, the Yallourn mine, or the Loy Yang mine.
9. For each rehabilitation option identified under paragraph 8:
  - a. whether, and to what extent, the option would decrease the risk of a fire that could impact the mine and if so, the cost of the option relative to the cost of other fire prevention measures
  - b. whether, and to what extent, the option would affect the stability of the mine
  - c. whether, and to what extent, the option would create a stable landform and minimise long-term environmental degradation
  - d. whether, and to what extent, the option would ensure that progressive rehabilitation is carried out as required under the *Mineral Resources (Sustainable Development) Act 1990 (Vic)*
  - e. the estimated timeframe for implementing the option
  - f. the option's viability, any associated limitations and its estimated cost
  - g. the impact of the option on any current rehabilitation plans for each mine
  - h. whether, and to what extent, the option would impact the future beneficial use of land areas impacted by the mines
  - i. whether the option is otherwise sustainable, practicable and effective.
10. Having regard to the rehabilitation liability assessments that have been or will be reported in 2015 by the operators of each of the Hazelwood mine, the Yallourn mine, and the Loy Yang mine, as required by the *Mineral Resources (Sustainable Development) Act 1990 (Vic)*, and to the outcome of the Rehabilitation Bond Review Project:
  - a. whether the rehabilitation liability assessments referred to above are adequate
  - b. whether the current rehabilitation bond system, being one of the measures to provide for progressive rehabilitation by end of mine life as required under the *Mineral Resources (Sustainable Development) Act 1990 (Vic)*, is, or is likely to be, effective for the Hazelwood mine, the Yallourn mine, and the Loy Yang mine
  - c. any practical, sustainable, efficient and effective alternative mechanisms to ensure rehabilitation of the mines as required by the *Mineral Resources (Sustainable Development) Act 1990 (Vic)*.

Under paragraph 18 of the Terms of Reference:

**Hazelwood mine** means the land the subject of Mining Licence Number 5004, as in force from time to time.

**Loy Yang mine** means the land the subject of Mining Licence Number 5189, as in force from time to time.

**Yallourn mine** means the land the subject of Mining Licence Number 5003, as in force from time to time.

**Rehabilitation Bond Review Project** means the current review into rehabilitation bonds and the methodology by which they are calculated, as referred to at page 1612, lines 7–8 of the transcript of the Hazelwood Mine Fire Inquiry dated 10 June 2014.

**Work Plan** means a work plan approved under the *Mineral Resources (Sustainable Development) Act 1990* (Vic) or endorsed pursuant to clause 21A of the Agreement set out in Schedule 1 to the *Mines (Aluminium Agreement) Act 1961* (Vic), as amended by the Amendment Agreement set out in Schedule 2 to that Act, as the case may be.

## ESTABLISHMENT OF THE INQUIRY

### THE BOARD

On 26 May 2015, the Governor in Council established the Hazelwood Mine Fire Board of Inquiry and appointed the following Board members:

#### BERNARD TEAGUE, CHAIRPERSON

Justice Bernard Teague AO was a Supreme Court Judge from 1987 to 2008. During this period he also chaired the Adult Parole Board and the Victorian Forensic Leave Panel, and was a Council member at the Institute of Forensic Mental Health. Prior to his appointment to the Supreme Court, Justice Teague was a solicitor specialising in defamation and other civil law.

Justice Teague was Chair of the 2009 Victorian Bushfires Royal Commission and Chair of the 2014 Hazelwood Mine Fire Inquiry.

#### JOHN CATFORD, BOARD MEMBER

Professor Emeritus John Catford is a registered medical practitioner and the Executive Director, Academic and Medical, of the Epworth HealthCare Group.

Professor Catford has been a Professor of public health for 30 years and has held senior academic and health service management positions in Australia and the United Kingdom, and with the World Health Organization. In 2008, Professor Catford led the establishment of the School of Medicine at Deakin University in Geelong. He was appointed Vice President and Deputy Vice Chancellor of Deakin University in 2011.

Professor Catford was a Board member of the 2014 Hazelwood Mine Fire Inquiry.

#### ANITA ROPER, BOARD MEMBER

Mrs Anita Roper is an experienced Director with a strong background in sustainability. Her career spans the public and private sectors. She has over 30 years of experience in senior management roles working with business, government, communities and multilateral agencies in Australia and internationally. She is currently a Director of Yarra Valley Water, a Board member of the Fitzroy Football Club, and a member of the Victorian Public Sector Commission Advisory Board.

Mrs Roper's previous roles include Chief Executive Officer at Sustainability Victoria and Global Director of Sustainability with Alcoa (New York). She has also previously served as a non-executive Director of Pacific-Hydro and as Chair of the Board's Health, Safety, Sustainability and People Committee; as a member of AngloGold Ashanti's Global Panel on Sustainability; and as a Board member of the Women's Network for a Sustainable Future (New York).

Mrs Roper's mining industry background saw her play a lead role in the engagement of stakeholders and the development of the approach adopted by the Board in inquiring into Terms of Reference 8, 9 and 10. Her knowledge and insight around key rehabilitation issues, combined with her engaging and open manner, proved invaluable in discussions held with the mine operators, agencies and the community.

Regrettably from late November 2015, Mrs Roper was no longer able to participate as a Board member due to a medical condition.

On 17 March 2016, the Terms of Reference were amended to empower the Chairperson to determine that the Board, for this report, is constituted by Justice Teague and Professor Catford. The Chairperson so determined on 22 March 2016.

## HAZELWOOD MINE FIRE INQUIRY SECRETARIAT

The Hazelwood Mine Fire Inquiry Secretariat was established to support the Board of Inquiry. Ms Genelle Ryan headed the Secretariat. Members of the Secretariat are listed in Appendix A. The Board thanks them for their professionalism, dedication and commitment to this Inquiry. Throughout the period of the Inquiry, Secretariat staff were required to travel extensively, work extended hours and undertake demanding tasks within short deadlines relating to the diverse Terms of Reference which were operating concurrently. The Secretariat was greatly benefitted by its staff with expert knowledge relating to the Terms of Reference, in particular Mr Andrew Radojkovic and Ms Cassie Nicholls for their contribution to this report. The Board also acknowledges K&L Gates, in particular Ms Justine Stansen, for contributing legal expertise.

## COUNSEL ASSISTING

Counsel Assisting, Mr Peter Rozen and Ms Ruth Shann, provided the Board with legal advice and guidance throughout the Inquiry. They also managed the Inquiry's series of four public hearings and forums which were held in various locations including Anglesea, Melbourne, Morwell and Traralgon.

The Board recognises the significant contribution that Counsel Assisting, assisted by the Secretariat, made to the concurrent management of these hearings (totalling 15 days) as well as the Health Improvement Forums (totalling five days). These public events also required extensive travel, extended hours, as well as excellent advocacy and facilitation skills. The Board thanks Mr Rozen and Ms Shann for their assistance.

## ACKNOWLEDGEMENTS

For their assistance throughout the Inquiry, the Board thanks the government departments and agencies contributing to the Inquiry, the Victorian Government Solicitor and his office, EnergyAustralia Yallourn Pty Ltd and its solicitor Clayton Utz, GDF Suez Australian Energy and its solicitor King & Wood Mallesons, AGL Loy Yang Pty Ltd and its solicitor Ashurst Australia, and Environment Victoria and its solicitor Environmental Justice Australia.

## THE BOARD'S APPROACH

The Board recognised that effectively conducting this Inquiry required genuine engagement with the Latrobe Valley community. The Board emphasised transparency and accessibility throughout this Inquiry and endeavoured to hear and understand the concerns of the Latrobe Valley community relevant to paragraphs 8, 9 and 10 of the Inquiry's Terms of Reference. Members of the Board, Counsel Assisting, Secretariat staff, an international mine rehabilitation expert, and consultants from Jacobs Group (Australia) Pty Ltd visited the Latrobe Valley as part of this Inquiry.

## COMMUNITY CONSULTATIONS

On 4 and 5 August 2015, the Board held five facilitated community consultation sessions in Traralgon and Morwell. Seventy-two people attended the consultations, including representatives from the Latrobe Valley's three mine operators and various community groups. At the consultations, the Board provided an overview of the Inquiry and invited participants to discuss the following questions:

- Question 1: What are the long-term infrastructure needs of the Latrobe Valley that the mine sites could deliver?
- Question 2: What should be done towards these desired ends while these mine sites are still operating?

Issues raised by community participants during these consultations, and considered by the Board as part of this Inquiry, related to the themes of job creation; safety and stability of the mines; communication and community engagement; roles and responsibilities in rehabilitation; integration of planning and rehabilitation approaches; revegetation; alternative uses for coal and the mine sites; and ongoing maintenance and monitoring of the mine sites.

The Board also considered issues raised by community participants regarding final land use (how the rehabilitated mine sites could be used after rehabilitation). Themes raised included waste management, alternative energy generation, conservation, flood management, industry development, recreation and tourism.

The Board thanks the community members and the mine operators' representatives who attended the community consultations and provided the Board with invaluable insights and information.

## PUBLIC SUBMISSIONS

Individuals and organisations further contributed to this Inquiry by making public submissions. The Board accepted written submissions specific to Terms of Reference 8, 9 and 10, until 24 August 2015. Board members read and considered all written submissions (listed at Appendix B). Common themes in these submissions included rehabilitation options; final landforms and land use; community engagement and regional planning; safety and stability of mines; adequacy of rehabilitation bonds; and potential improvements to the current bond system.

## COMMUNICATIONS

A website (<http://hazelwoodinquiry.vic.gov.au/>) was established for the 2014 Hazelwood Mine Fire Inquiry. This website was updated when the Inquiry was re-opened, and has since been continuously updated to provide information to the Latrobe Valley and broader Victorian community about the Board, Terms of Reference, public submissions, community consultations, and public hearings. The Latrobe Valley community was further informed about how they could participate in, or attend the Inquiry, through brochures, posters, mail-outs, media promotion and advertising.

Members of the public were able to contact the Inquiry by phone (1300 556 034) and email ([info@hazelwoodinquiry.vic.gov.au](mailto:info@hazelwoodinquiry.vic.gov.au)) for the duration of the Inquiry.

## INDEPENDENT EXPERTS

The Board engaged Jacobs Group (Australia) Pty Ltd as an independent consultant, to provide advice to the Inquiry regarding mine rehabilitation options, and mechanisms to coordinate rehabilitation efforts. The Board engaged Accent Environmental Pty Ltd as an independent consultant, to provide advice to the Inquiry about alternative financial assurance mechanisms.

Dr Friedrich von Bismarck, Head of the German Joint-Governmental-Agency for Coal Mine Rehabilitation, was engaged by the Board to provide independent advice about rehabilitation options and mechanisms to coordinate rehabilitation. The Board arranged for Dr von Bismarck to travel to Australia to consult with local experts. Ms Meredith Fletcher was engaged to provide an historical overview of brown coal mining and electricity generation in the Latrobe Valley prior to the privatisation of the mines.

The Board thanks the independent experts for their contribution.

## PUBLIC HEARINGS

Public hearings relevant to Terms of Reference 8, 9 and 10 were held over seven days in Traralgon on 8–11, 14–15 and 18 December 2015. Counsel Assisting, Mr Rozen and Ms Shann, led evidence and made final submissions to the Board. Leave to appear before the Inquiry was granted to the State, EnergyAustralia Yallourn Pty Ltd, GDF Suez Australian Energy, AGL Loy Yang Pty Ltd, and Environment Victoria.

The Board heard evidence from:

- senior officials from the Department of Economic Development, Jobs, Transport and Resources; the Department of Environment, Land, Water and Planning; the Technical Review Board; Emergency Management Victoria; Coal Resources Victoria; and the Environment Protection Authority
- representatives from the Latrobe City Council, Southern Rural Water and Gippsland Water
- a Latrobe Valley community member
- senior mine management personnel from EnergyAustralia Yallourn Pty Ltd, GDF Suez Australian Energy and AGL Loy Yang Pty Ltd
- local and international geotechnical, hydrogeological, environmental, rehabilitation and mine closure experts.

Appendix C lists the names of witnesses who appeared at the public hearings. Appendix D lists exhibits that were tendered at the public hearings.

## OUTCOMES OF THE INQUIRY

The Board has made 19 recommendations, taking into account evidence before the Board and the feasibility of implementation. The Board has framed its recommendations with a degree of flexibility so as not to limit their implementation. Where the Board considers that the recommendations should be implemented within particular timeframes, this is made explicit. The Board has also made three affirmations, affirming the State or mine operators where they have already taken action or have committed to take action in response to issues raised during this Inquiry.

The Board has considered how implementation of these recommendations and affirmations will be monitored. For the Board's recommendations from the 2014 Hazelwood Mine Fire Inquiry, the State contracted the Hazelwood Mine Fire Inquiry Implementation Monitor to conduct a monitoring role. More recently, the role of monitoring the 2014 recommendations has been divided between the Hazelwood Mine Fire Implementation Monitor (monitoring the recommendations relating to GDF Suez Australian Energy) and the Inspector-General for Emergency Management (monitoring the recommendations relating to the State).

The Inspector-General is established under s. 61 of the *Emergency Management Act 2013* (Vic) (Emergency Management Act). The objective of the office is to 'provide assurance to government and the community in respect of emergency management arrangements in Victoria and to foster improvement of emergency management in Victoria.'<sup>1</sup> Section 64 of the Emergency Management Act provides that the Inspector-General has powers to monitor and report on the implementation of recommendations arising from the system-wide reviews it conducts.<sup>2</sup> It also has powers to 'perform any other functions conferred on the [Inspector-General] by or under this or any other Act.'<sup>3</sup> The Inspector-General is employed as a member of the Public Service under Part 3 of the *Public Administration Act 2004* (Vic) (Public Administration Act) and reports directly to the Minister for Emergency Services.<sup>4</sup> The Board considers that in contrast, Governor in Council appointments (for example, that of Emergency Management Commissioner Craig Lapsley) are considered to be more independent than appointments under the Public Administration Act.

The Board considers it essential that the oversight of the recommendations from this report, and other volumes of the Hazelwood Mine Fire Inquiry Report 2015–16, is independent of the State and the mine operators. Further, the Board considers that expertise relating to the issues raised by the Hazelwood Mine Fire Inquiry is necessary.

The Board is of the view that the Inspector-General's current role, as stipulated under the Emergency Management Act, is less appropriate than a monitor who will provide independent oversight of the State's implementation of the Board's recommendations. Further, the Board is concerned that the Inspector-General's office, which deals with Emergency Management issues, may not have the relevant expertise.

The Board considers that the Hazelwood Mine Fire Inquiry Implementation Monitor should be given legislative powers to oversee the implementation of its 2015–16 recommendations and produce publicly-available annual progress reports. The Board notes that the powers provided to the Hazelwood Mine Fire Inquiry Implementation Monitor are confined by the terms of the contract between it and the State, and are of a more limited nature than the powers conferred on the Bushfires Royal Commission Implementation Monitor under the *Bushfires Royal Commission Implementation Monitor Act 2011* (Vic).<sup>5</sup>

The Board is of the view that independent oversight and broad powers are integral to ensuring accountability and transparency in the State's implementation of the Board's recommendations.

The Board recommends that the State empower the Hazelwood Mine Fire Implementation Monitor, in a legislated role independent from the Victorian public service, to:

- oversee the implementation of these recommendations and the commitments made by the State and the mine operators during this Inquiry for the next three years
- report publicly on an annual basis on the progress made in implementing the recommendations and commitments for the next three years.

## SOME COMMENTS ON CONDUCTING INQUIRIES

The *Inquiries Act 2014* (Vic) (Inquiries Act) came into effect on 15 October 2014. The re-opened Hazelwood Mine Fire Inquiry is the first to be established under Part 3 of the Act. This Board is in a unique position to make observations about the process and procedures provided under the Act and the Inquiries Regulations 2015 (Vic) (Inquiries Regulations).

### HEARINGS

In fulfilling its Terms of Reference concerning the contribution of the 2014 Hazelwood mine fire to any increase in deaths, mine rehabilitation and the Anglesea mine (that is, Terms of Reference 6, 8, 9, 10 and 11), the Board heard evidence at 'traditional' public hearings. Counsel Assisting called witnesses who were sworn in or made affirmations.<sup>6</sup> Each witness was examined by Counsel Assisting and was then examined by counsel granted leave by the Board to question that witness. The hearing rooms were arranged in a manner loosely modelled on a court room. This process was considered appropriate in relation to Terms of Reference 6, 8, 9, 10 and 11 because the Board was asked to make findings about past conduct in circumstances where there were real disputes about what the findings should be.

By contrast, as explained in Volume 3 of the Hazelwood Mine Fire Inquiry Report 2015–16, the Board took a very different approach to informing itself in relation to Term of Reference 7, which was concerned with the future health needs of the Latrobe Valley. It convened a series of 'Health Improvement Forums' rather than public hearings. This reflected the forward-looking nature of Term of Reference 7, which recommended measures to improve health. There was no evidence that required testing using formal inquisitorial hearing processes in relation to that Term of Reference. The Board made no adverse findings. Those who attended the forums were referred to as participants and not witnesses, and they were not sworn in. Counsel Assisting and the Principal Legal Advisor performed the role of mediators and facilitators, rather than their traditional role.

The different approaches taken by the Board to inform itself worked well. They reflect the high degree of flexibility accorded to a Board under Part 3 of the Inquiries Act.

## EXPERT PANELS

The highly specialised and diverse subject matter of the Board's inquiry meant that the Board heard from a number of expert witnesses.

The Board greatly benefitted from hearing evidence in the form of expert panels, in which two or more expert witnesses gave their evidence concurrently. This was particularly helpful to the Board in relation to Term of Reference 6, during which epidemiologists and biostatisticians gave evidence as a panel. Prior to giving evidence at the public hearings, these experts had met privately at the request of the Board. The meetings were facilitated by a member of the Inquiry's Secretariat. The experts considered a series of questions prepared by Counsel Assisting, and prepared a joint report setting out areas of agreement and disagreement. The joint expert report was tendered by Counsel Assisting as an exhibit at the public hearings.

A similar process was followed in relation to the Terms of Reference 8, 9 and 10. A group of geotechnical engineers, hydrogeologists and other mine rehabilitation experts met privately at the request of the Board to consider a series of questions prepared by Counsel Assisting. The meeting was facilitated by a member of the Inquiry's Secretariat. The joint expert report was tendered by Counsel Assisting when the experts gave evidence as part of a panel at the public hearing.

The Board also heard from a large number of expert panels in the Health Improvement Forums as part of its Term of Reference 7 considerations.

The principal benefit to the Board of hearing from expert panels in circumstances where the experts had previously met and produced a joint report was the added confidence the Board could have in an opinion expressed by several experts, some of whom had been engaged by parties with diverse interests. Where there was disagreement between the experts, the area of disagreement was generally narrowed and clarified because the witnesses could respond immediately to each other's views as part of the panel. The feedback from the experts about their experience of the Inquiry was also positive. A number of experts indicated to Counsel Assisting that the approach taken was more in keeping with a genuine and informed examination of important issues than the traditional adversarial process in which each expert is examined separately.

The Board expresses its gratitude to all of the experts who generously gave their time, often at considerable personal inconvenience, to assist the Board. They fulfilled the true role of the expert witness and have made the Board's difficult tasks considerably easier.

## ADVERSE FINDINGS

Section 76 of the Inquiries Act requires the Board to follow a procedure before it makes 'a finding that is adverse to a person'. The statutory procedure essentially codifies the common law requirements concerning procedural fairness.<sup>7</sup>

Throughout the course of this Inquiry, the Board has construed the expression 'a finding which is adverse to a person' (which is not defined in the Inquiries Act) broadly. In the Hazelwood Mine Fire Inquiry Report 2015–16, Volume 2, the Board made findings that may affect the professional reputation of the former Chief Health Officer. In this report, the Board has made findings that may be adverse to the financial interests of mine operators. It has also made findings that are critical of the manner in which the Latrobe Valley mines have been regulated, and are therefore adverse to the Mining Regulator.

In each case, the Board has provided the affected party with a copy of a draft part of the report setting out the proposed finding and the 'matters on which the proposed finding is based' as required by s. 76(1)(a) of the Inquiries Act. The affected party was asked to make any submissions about those matters within a specified timeframe.

The Board considered submissions by affected parties as required by s. 76(2) of the Inquiries Act. The Board was assisted by these submissions. In a number of cases, the Board modified its proposed adverse findings in response to the submissions. Where the Board has determined to make the adverse finding despite the submissions, the Board has set out, in summary form, the submissions of the party, as required by s. 76(3) of the Inquiries Act.



As noted above, the Board has maintained a website as part of its commitment to community engagement about the Inquiry. Evidence given and submissions made at the hearings were published on the website. However, the process followed by the Board in compliance with s. 76 of the Inquiries Act has necessarily been treated differently. Because the submissions made by the parties have been in response to a draft report, those submissions have not been published and have been treated confidentially by the Board.

The s. 76 process has been of assistance to the Board in fulfilling its Terms of Reference. Compliance with s. 76 has not been particularly onerous.

### COSTS FOR WITNESSES AND EXPERTS

Section 82 of the Inquiries Act provides that a person who attends a Board of Inquiry in accordance with a notice to attend or 'at the request of the Board of Inquiry' is entitled to be paid 'expenses and allowances in accordance with the prescribed scale' in circumstances where the witness 'loses income because of attending an inquiry'.<sup>8</sup> The relevant scale is prescribed in Part 2 of the Inquiries Regulations.

An issue that has arisen during the course of this Inquiry is the meaning of the phrase 'at the request of the Board of Inquiry' in s. 82(1)(b) of the Inquiries Act. All of the witnesses who gave evidence at the public hearings and Health Improvement Forums did so as either representatives of parties granted leave to appear or at the request of the Board, with very few being served with a notice to attend. This included expert witnesses who had been retained by parties granted leave to appear at the public hearings. The Board assumes that most of the expert witnesses were paid for their time by the parties who had retained them.

However, the Board's Secretariat received a number of claims from witnesses for reimbursement of expenses associated with giving evidence at the public hearings. The Board considers that the Inquiries Act uses specific and different language in describing the circumstances where a witness is entitled to claim reimbursement of lost income and other expenses. The Board considers that a witness who is also a party is not entitled to make a claim under s. 82 as they do not give evidence 'at the request of the Board' but rather they 'appear' at a public hearing pursuant to s. 62 of the Inquiries Act. Further, the Board considers that the Act does not provide scope for the Board to pay witnesses for time spent preparing to give evidence in addition to actually giving evidence in a public hearing.

The Board considers that the State should clarify under what circumstances expenses and allowances should and should not be paid to witnesses.



Dozer at the toe of a mine batter  
(source: Department of Economic Development, Jobs, Transport and Resources)



**PART TWO**  
**BACKGROUND**  
**INFORMATION**

## PART 2 BACKGROUND INFORMATION

### 2.1 OVERVIEW

This Part provides background information relevant to the Board's inquiry, and a context for informing consideration of Terms of Reference 8, 9 and 10. This Part includes information about:

- the community, landscape, geology and hydrogeology of the Latrobe Valley (the region where the Yallourn, Hazelwood and Loy Yang mines are situated)
- the Latrobe Valley's coal resource and key mining terms that are used throughout this report
- a history of mining in the Latrobe Valley up until the mines were privatised in the mid-1990s
- current state, national and international policy relevant to the long-term future of coal-fired power generation.

### 2.2 ABOUT THE LATROBE VALLEY

#### 2.2.1 COMMUNITY

The Latrobe Valley is situated approximately 135 kilometres east of Melbourne in the Gippsland region. It covers two local government areas over a total area of 5,453 square kilometres<sup>1</sup>—Latrobe City, where the Hazelwood, Yallourn and Loy Yang mines are located, and Baw Baw Shire.<sup>2</sup> Due to the location of the mines, the data in this section focus on Latrobe City.

Latrobe City is situated on the land of the Brayakaulung clan of the Gunaikurnai people.<sup>3</sup> There are over 73,000 residents in Latrobe City, with the majority of the population living in the towns of Traralgon, Morwell, Moe, Newborough and Churchill.<sup>4</sup>

Major industries in the region include coal mining and electricity generation, forestry and paper production, food processing and engineering. Federation University Australia is located in Latrobe City. As the regional centre for Gippsland, Latrobe City is also home to a number of service providers and government agencies.<sup>5</sup>

The Latrobe Valley community contributes significantly to Victoria's economic wealth. However, the community is less prosperous and less healthy overall than the rest of Victoria. The median household income in the Latrobe Valley is significantly lower than the Victorian average, and there is a much higher proportion of low income households in the Latrobe Valley.<sup>6</sup> In September 2015, the unemployment rate in Latrobe City was 7.8 per cent<sup>7</sup>, and unemployment was as high as 14.4 per cent in Morwell<sup>8</sup> (compared with the Victorian average of 6.3 per cent<sup>9</sup>).

#### 2.2.2 LANDSCAPE

The Latrobe Valley is a broad and relatively flat valley that sits 20 to 100 metres above sea level. It is bordered by the Strzelecki Ranges to the south and the Great Dividing Range to the north. The rolling foothills that surround the valley are up to 250 metres above sea level.<sup>10</sup> The average annual rainfall in the area is 731 millimetres.<sup>11</sup>

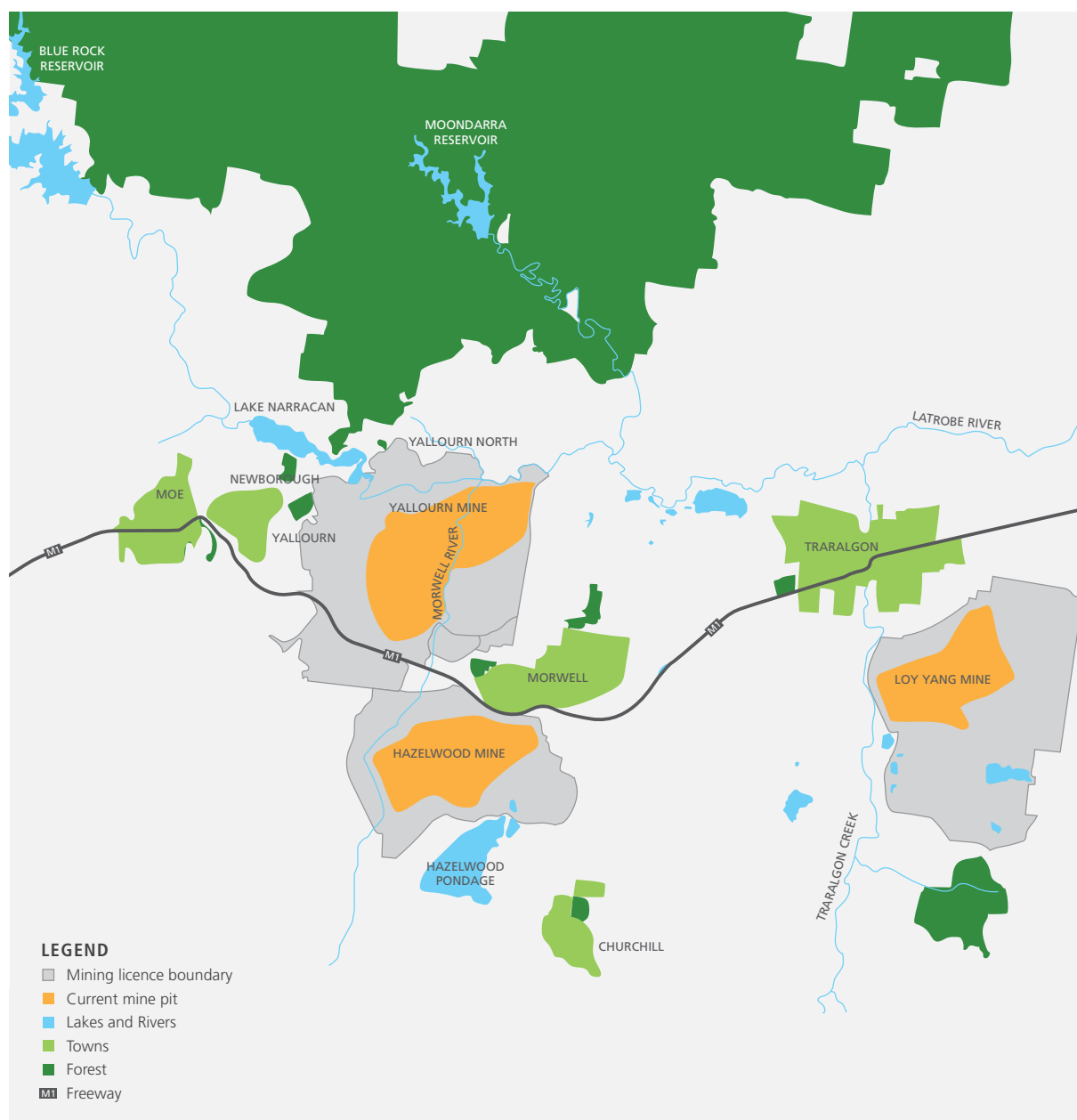
The major waterways in the area are the east-flowing Latrobe River and its tributaries—the Morwell River (including Middle Creek), Traralgon Creek and Bennett's Creek. The multiple streams that dissect the slopes of the Strzelecki Ranges and the Great Dividing Range, including Tanjil River, Tyers River and Rintoul's Creek, feed into the Latrobe River.<sup>12</sup>

The Morwell River has been diverted a number of times to facilitate access to coal. The current Morwell River Diversion changes the course of the river by carrying it on an embankment across the centre of the Yallourn mine until it joins the Latrobe River.<sup>13</sup>

Water for the Latrobe Valley is stored in dams, including Lake Narracan, which was constructed between 1959 and 1961 and provides water for cooling the Latrobe Valley power stations. Lake Narracan is situated on the Latrobe River and has a capacity of 7,230 megalitres.<sup>14</sup> The dam at Blue Rock Reservoir is approximately 15 kilometres upstream from Lake Narracan, on the Tanjil River. It was constructed between 1979 and 1984 and supports the Latrobe Valley power stations. It has a capacity of 208,190 megalitres.<sup>15</sup>

The key waterways and geographical features of the Latrobe Valley are shown in Figure 1.

**Figure 1. Map of the Latrobe Valley**



Source: Adapted from GeoVic, Department of Economic Development, Jobs, Transport and Resources

## 2.3 COAL AND THE LATROBE VALLEY

### 2.3.1 THE COAL RESOURCE

Coal is a combustible mineral that is widely used as a fuel to generate electricity.<sup>16</sup> It forms over millions of years when vegetable matter partially decomposes in conditions of restricted air and increased pressure and temperature.<sup>17</sup>

Coal progressively transforms through stages—from peat, to brown coal or lignite, to black coal (which includes sub-bituminous coal, bituminous coal and anthracite).<sup>18</sup> It is formed in beds with depths ranging from less than a millimetre to many metres. Coal beds thick enough to be mined are referred to as ‘coal seams’.<sup>19</sup>

Deposits of brown coal originated from forests and swampy environments between 7 and 25 million years ago, making them relatively young compared to deposits of black coal, which can be over 250 million years old.<sup>20</sup> Victoria is home to one of the largest known deposits of brown coal in the world. There are an estimated 65 billion tonnes of brown coal in the Latrobe Valley, approximately half of which has been identified as ‘potentially economic’.<sup>21</sup>

A key feature of the Latrobe Valley’s coalfield is its relatively shallow overburden and narrow interseams (collectively referred to as waste rock). The overburden (topsoil, sand, clay and other non-coal material that cover the coal) is between 6 and 30 metres deep,<sup>22</sup> and covers coal seams up to 100 metres thick with multiple seams giving a virtual continuous thickness of up to 230 metres.<sup>23</sup> Narrow layers of non-coal material known as interseams run between the coal, which are composed of sand, silt and clay.<sup>24</sup> The shallower overburden and narrow interseams, and thicker coal seams, mean that when the coal is mined, there is a lower ratio of waste rock to coal, making mining cost effective. This ratio, known as a strip ratio, is much lower in mines in the Latrobe Valley than in many other mines around the world. For example, the strip ratio of the Hazelwood mine is between 4:1 and 5:1 (coal to waste rock),<sup>25</sup> whereas the strip ratio in Germany’s brown coal mines is almost the reverse.<sup>26</sup>

While Victoria’s coal is low in impurities compared to other deposits around the world, it is high in moisture, with a water content of up to 70 per cent.<sup>27</sup> The coal cannot be used wet for energy generation, so it undergoes a drying process prior to use in power stations.<sup>28</sup> However, as stated by Geoscience Australia, ‘the high water content and reactivity of Gippsland Basin brown coal has precluded it from coal export, and its future development depends on advances in new drying, gasification and liquefaction technologies.’<sup>29</sup>

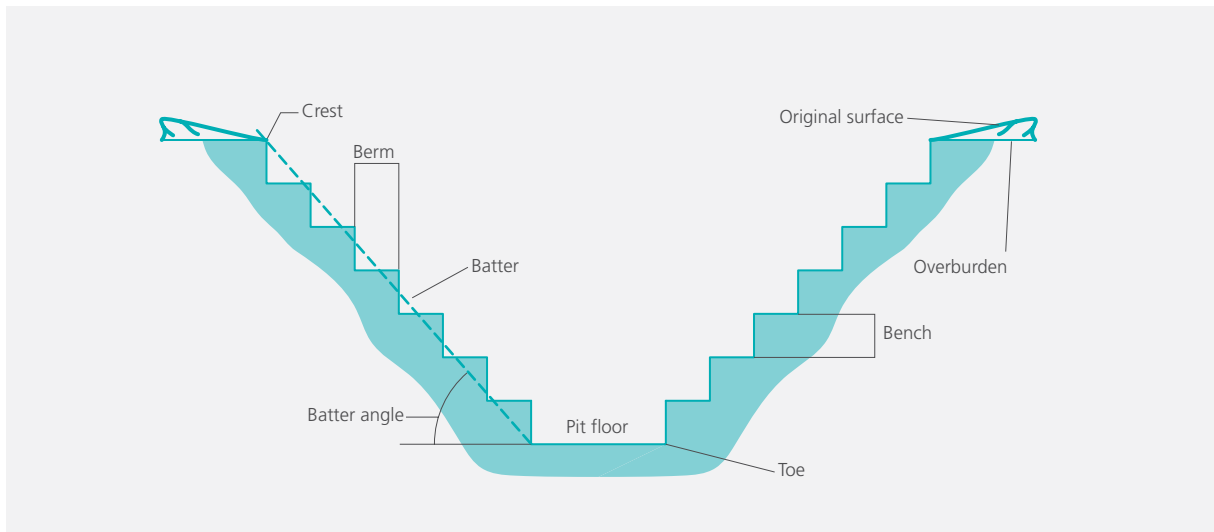
The coal in the Latrobe Valley is very light (only just heavier than water) with its density ranging from between 1.11 and 1.14 tonnes per cubic metre.<sup>30</sup> It is also ‘jointed’—meaning that there are multiple continuous cracks through the coal.<sup>31</sup> This means that the coal is very sensitive to movement as a result of interaction with water. As groundwater and coal are extracted, the unmined coal relaxes and moves, allowing natural joints, or cracks, to open up. If a crack then fills up with water, the water pressure in the crack can cause a whole block of coal to be pushed and slide outwards.<sup>32</sup> This is discussed in Part 6.3.1.

### 2.3.2 KEY MINING TERMINOLOGY

The three mines in the Latrobe Valley are open cut mines. Open cut mining is used when the resource to be mined is relatively close to the surface and is spread over a large area. Open cut mining involves removing overburden from the surface of the mining area and placing it in a stockpile (or ‘overburden dump’). Overburden is often used in rehabilitating a mine. The coal seam is then exposed by digging a pit into the ground.

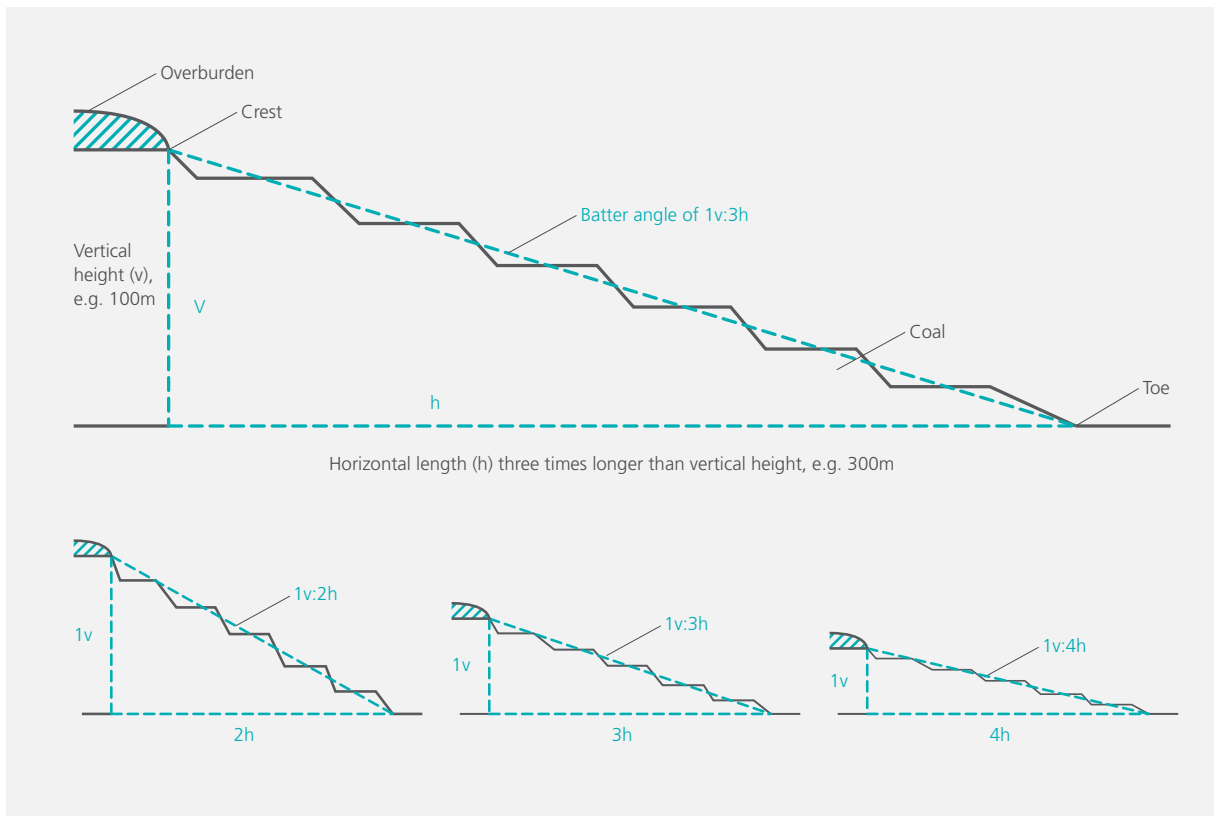
The bottom of the pit is known as the ‘floor’, and the walls are known as ‘faces’ or ‘batters’. The top or edge of the mine is called the ‘crest’, and the point where the face joins the floor is the ‘toe’. As the coal is excavated, the miners cut ‘benches’ into the faces of the mine. These are individual working levels of the mine, with sloping surfaces separated by flat surfaces called ‘berms’. Berms provide access to the batter and are used for mine infrastructure and utilities. Once the limit of extraction has been reached at a bench, it is referred to as a ‘worked out’ or ‘permanent’ bench’. Figure 2 illustrates these terms.

Figure 2. Mine terminology



The overall angle or steepness of the face is called the 'batter angle' and is measured in terms of a ratio between the vertical height and horizontal length of that slope. This ratio is shown in mining terms as 'v:h', so a slope might be termed 1v:3h when the horizontal length (h) of the batter is three times longer than the vertical height (v). Figure 3 shows an example of how this batter angle is measured. The term 'battered off' refers to the process of flattening or reducing the angle of the batter.

Figure 3. Batter angle examples



Mining operations are complex and technical, and this report only refers to those operations that are relevant to the Board's deliberations. Some of the terminology used in this report includes:

- Rehabilitation—the process of returning land disturbed to a stable, productive and/or self-sustaining condition, consistent with how the land will be used post-mining.<sup>33</sup>
- Progressive rehabilitation—the work undertaken towards that goal during the life of the mine, as areas become free from mining activity or significant infrastructure is removed.<sup>34</sup>
- Final rehabilitation—occurs after mining has ceased and results in the final landform.<sup>35</sup>
- Dredgers/bucket wheel excavators—very large and heavy machinery that continuously digs the coal using a large wheel covered with buckets that scoop the coal as the wheel rotates.
- Dozer push—a method of mine rehabilitation where coal from one bench is redistributed to the bench above or below to achieve the planned batter profile. This differs from 'truck and shovel' rehabilitation, where a large quantity of coal is excavated, placed into a truck, transported and dumped elsewhere.<sup>36</sup>

This report also uses various units of measurement described in Table 1 below.

**Table 1. Units of measurement**

Unit	Definition
Megalitre (ML)	One million litres
Gigalitre (GL)	One thousand megalitres, or one billion litres
Megawatt (MW)	One million watts of electricity
Megatonne (Mt)	One million tonnes
Relative level (RL)	A measurement of height in metres relative to sea level. Represented as an acronym, where 'RL +10m' means a relative height of 10 metres above sea level, and 'RL -10m' means 10 metres below sea level

### 2.3.3 REGIONAL HYDROGEOLOGY AND THE MINES

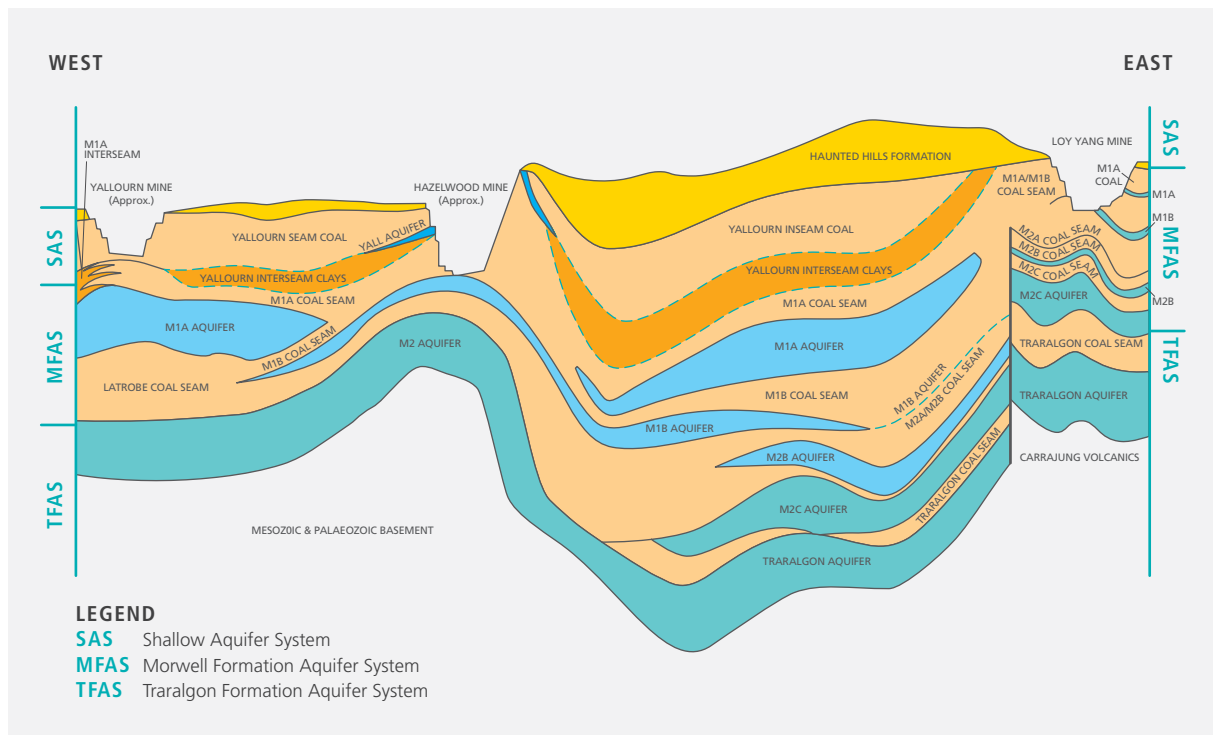
As well as the network of waterways outlined in Part 2.2.2, the Latrobe Valley has a system of groundwater aquifers that are intersected by and underlie the mines.<sup>37</sup> Groundwater is the water located beneath the Earth's surface. Aquifers are naturally occurring underground bodies of porous rock (such as sand or gravel) in which groundwater can move from place to place.<sup>38</sup>

Aquifers range in thickness and extent, and can vary laterally.<sup>39</sup> An aquifer system comprises multiple aquifers that are geologically grouped together.

Beneath the Latrobe Valley, three major aquifer systems have the greatest impact on the mines—the near-surface Shallow Aquifer System, the Morwell Formation Aquifer System and the Traralgon Formation Aquifer System. The Morwell and Traralgon Systems are major aquifers separated by layers known as aquitards, which contain less permeable materials such as coal, clay or silt. The Shallow Aquifer System is closer to the surface and water from this system is typically used for stock and domestic purposes.<sup>40</sup> Figure 4 is a representation of a cross-section of the Latrobe Valley's aquifers. The three mines are indicated, showing the proximity of each mine floor to the aquifers.



**Figure 4. Schematic drawing representing hydrogeological features of the Latrobe Valley aquifer systems and mines<sup>41</sup>**



Understanding the role of these aquifers is important because they can have major impacts on the stability of the mines. As overburden and coal are removed from the mine pit, the pressure of the water in the aquifers below the coal can push upwards against the floor and batters of the mine. The coal in the Latrobe Valley is very light, so this pressure can sometimes cause what is called 'floor heave', where the mine floor moves upward.<sup>42</sup>

As mentioned previously, mine stability can also be impacted by excess surface water, from rainfall, run-off or water from streams or lakes. Surface water can enter the joints in the coal, which can result in movement of the batters.<sup>43</sup>

To counter these risks, the mine operators 'dewater' by pumping groundwater out of aquifers both below and within the coal seams.<sup>44</sup> In addition, long horizontal drains are drilled into the batters of the mines, allowing water to drain from the coal. These are known as 'bores'. The aim of the bores is to keep both surface water and groundwater away from the coal, and reduce water pressure in the batters.<sup>45</sup>

In the Latrobe Valley, groundwater pressure from the Morwell Formation Aquifer System has required dewatering at the Yallourn, Hazelwood and Loy Yang mines; and groundwater pressure from the Traralgon Formation Aquifer System has required dewatering at the Loy Yang and Hazelwood mines. The Shallow Aquifer System has only required intermittent dewatering at the Yallourn mine.<sup>46</sup>

Groundwater extraction is licensed by volume, with licensees required to monitor the amount pumped out of the aquifers. Water licensing is discussed further in Part 4 of this report.

As well as dewatering, risks from aquifer pressure can be minimised by filling the mine pit with water, overburden or other material, or a combination of these. This is done to achieve what is known as 'weight balance', where the upward pressure of the aquifers is either decreased by dewatering, or counterbalanced by the downward pressure of the water and/or backfilled overburden.<sup>47</sup> These matters are discussed further in Part 6 of this report.

### 2.3.4 HISTORY OF COAL MINING IN THE LATROBE VALLEY

Brown coal was first discovered in the Latrobe Valley in 1873,<sup>48</sup> and since the mid-1900s, the region has been at the centre of Victoria's coal mining and power generation activities.<sup>49</sup> Coal has played a key role in the social and economic development of the Latrobe Valley region, although not without some costs to the community and environment.

In 1918, legislation was passed in the Victorian Parliament to establish the Electricity Commissioners—a public corporation initially tasked with promoting the use of electricity, including the development of a scheme for coal mining and 'electrical undertaking' in Morwell.<sup>50</sup> In 1920, the Electricity Commissioners became the State Electricity Commission of Victoria (SECV), and its powers were expanded to include development of 'open cut workings for the production of raw brown coal.'<sup>51</sup> The SECV took on the task of developing an open cut mine, briquette factory and power station 10 kilometres north of Morwell, with the first sod turned for the power station in 1921 (see Figure 5). This mine subsequently became known as Yallourn, from Aboriginal words meaning 'brown fire'.<sup>52</sup>

The development of Yallourn was significant for Victoria, not only because of the electricity it generated, but also because of the technological and industrial advances it represented. Yallourn became 'a national icon, a focus for national pride' and a symbol of modernity in Australia.<sup>53</sup> However, there were several emergency events in the first decades of the mine's establishment, including a major flood in 1934 and a fire in 1944, both of which caused lengthy interruptions to mining operations.<sup>54</sup>

With the development of the Yallourn site came a proposal to build a model town to house the new workforce for the mine. The SECV 'hoped that providing ideal conditions for its workers would lead to an ideal workforce.'<sup>55</sup> The town flourished for some time; however in 1969 the SECV announced that a new power station would be built in Yallourn, and in 1970 a Parliamentary Public Works Inquiry endorsed the demolition of the town.<sup>56</sup>

Demand for electricity post-World War II meant that the SECV had to expand its operations beyond the Yallourn mine.<sup>57</sup> In the late 1940s, the SECV announced that the Hazelwood mine, then known as the Morwell Open Cut, would be developed together with briquette factories. The development encountered challenges, with mining operations commencing in the mid-1950s.<sup>58</sup> In 1956, the SECV announced that Hazelwood power station would be built, and the development of briquette factories was abandoned.<sup>59</sup> In 1977, the SECV began construction of Loy Yang mine, and mining commenced in the early 1980s. Over the following years, the populations of Morwell and Traralgon grew as more workers were employed.<sup>60</sup>

The State did not require the SECV to develop a rehabilitation plan for the Loy Yang mine or for the other mines when they were established, although there was a general assumption that the pits would be flooded at the end of the mine life.<sup>61</sup> During SECV operations, only minimal progressive rehabilitation was undertaken at the mines, with future access to coal prioritised over rehabilitation efforts.<sup>62</sup> In 1983, legislation was introduced to require private mining companies to provide a rehabilitation bond. This legislation was reinforced through rehabilitation requirements introduced under the Mineral Resources Act (then known as the *Mineral Resources Development Act 1990* (Vic)). However, the SECV was exempted from the operation of those provisions through the *State Electricity Commission of Victoria Act 1958* (Vic).<sup>63</sup>

In the late 1970s and 1980s, the SECV began to show a greater interest in rehabilitation, culminating in the release of a discussion paper on a draft rehabilitation policy in 1985, and the adoption of a rehabilitation policy and formation of a consultative group to develop rehabilitation plans in 1986.<sup>64</sup> However, in 1993 a special report undertaken by the Victorian Auditor-General's Office into open cut mining production in the Latrobe Valley found that 'the SECV had not demonstrated that there was a structured and co-ordinated approach to achieving its environmental objective in the areas of land rehabilitation of open cuts and water quality management.'<sup>65</sup>

In response, the Chief General Manager of the SECV stated that, since 1986, 'extensive rehabilitation' had been completed, particularly with respect to overburden dumps. Regarding rehabilitation plans for the operational open cut mines, the Chief General Manager of the SECV noted that rehabilitation plans 'are currently being developed and will be progressively implemented during the next 20 to 40 year remaining life of these mines. Funding for these projects has been included in operational budgets.'<sup>66</sup>

By the late 1980s, the SECV was allocating up to 45 per cent of its annual earnings to pay its debts, which totalled more than \$8 billion. Public confidence in the SECV fell, and there was scrutiny from the community and government about a state-owned model of electricity supply.<sup>67</sup> After the 1992 state election, the Kennett Government began restructuring the industry, with the Latrobe Valley mines and power stations ultimately privatised in the mid-1990s.<sup>68</sup> Latrobe Valley resident, Mr David Langmore, submitted that at that time, the SECV had only undertaken 'limited amounts' of rehabilitation, and that while substantial work had been done at the Yallourn mine, no significant rehabilitation had commenced at the Loy Yang and Hazelwood mines.<sup>69</sup>

Following privatisation of the mines, the new mine operators each had a rehabilitation plan.<sup>70</sup> They provided a \$15 million rehabilitation bond to contribute to any rehabilitation liability should they default on their obligations and as an incentive for them to comply with these obligations.<sup>71</sup> In 2004, the Yallourn mine rehabilitation bond was reassessed and lowered to \$11,460,500.<sup>72</sup>

Currently, the Latrobe Valley mines supply approximately 95 per cent of Victoria's base load electricity.<sup>73</sup> Part 4 of this report provides an overview of the mines today, including their licence holders, licence terms and the scale of their operations. The State continues to regulate coal mining and implement coal development programs.<sup>74</sup> Part 3 of this report outlines the State's current regulatory framework.

### Figure 5. Historical photographs of the Yallourn power station



SECV Commissioners turning the first sod for the Yallourn power station, 5 February 1921

(source: Museum Victoria Collection, <http://collections.museumvictoria.com.au/items/764505>)



Yallourn power station circa 1930 (source: Museum Victoria Collection, <http://collections.museumvictoria.com.au/items/773882>)

### 2.3.5 ENVIRONMENTAL CONSIDERATIONS AND THE CHANGING POLICY CONTEXT

Mining operations can have a range of impacts on land stability, groundwater, fire risk, wildlife habitats, native vegetation, and waterways. In its submission to the Inquiry, Federation University Australia states that contamination from coal and its mining products can be an issue long after mine closure, and can cause harm to the environment and human health if not properly managed.<sup>75</sup>

The use of brown coal (that is, the generation of electricity) also has significant environmental impacts. In its written submission to the Inquiry, the Gunaikurnai Land and Waters Aboriginal Corporation describes to the Board how mining has damaged their Country, including through the diversion and damming of waterways.<sup>76</sup> The Board notes that the use of brown coal is a major contributor to Victoria's greenhouse gas emissions.<sup>77</sup> Mr Langmore submitted to the Board that '[t]he rehabilitation of the Latrobe Valley's brown coal open cut mines is arguably the greatest environmental challenge confronting Victoria in the next couple of decades.'<sup>78</sup>

Research undertaken by the CSIRO and the Australian Bureau of Meteorology predicts that, as a result of climate change, eastern Victoria (including the Latrobe Valley) will experience increasing average temperatures in all seasons; generally less rainfall in the cool seasons; increased intensity of extreme rainfall events; rising mean sea levels; and a harsher fire-weather climate.<sup>79</sup> This will have a broad range of significant impacts on the environment and the community.<sup>80</sup>

The role of water in achieving mine rehabilitation plans is a key environmental consideration. Since privatisation, the mine operators have developed rehabilitation plans in which the mines become pit lakes—and, as will be explained in Part 4, the Mining Regulator has approved these plans. In Part 6, the Board notes the vast quantities of water that will be needed to fill the mines under those plans—more than four times the volume of water in Sydney Harbour.

Community perceptions about the relative scarcity of water have changed during the last two decades in large part because of the long drought in Victoria between 1997 and 2009. In 2005, the *Water Act 1989* (Vic) was amended to include a new role for the responsible Minister—to make sure that a 'program of sustainable water strategies is undertaken for the State'.<sup>81</sup> Under s. 22C of that Act, a 'Sustainable Water Strategy must provide for the strategic planning of the use of water resources in the region to which it applies'. The applicable Strategy for the Latrobe Valley, the *Gippsland Region Sustainable Water Strategy*, was provided to the Board. It is discussed in Part 6.

There have been State and Commonwealth policies that address the impact of coal-fired electricity generation on Australia's environment. In July 2011, the Gillard Government announced the *Contracts for Closure* program as part of the Commonwealth's Clean Energy Future package. It aimed to encourage the closure of some of Australia's 'emissions-intensive' power stations by 2020, by providing financial incentives to power station operators to shut down early.<sup>82</sup> In September 2012, after beginning negotiations with a number of operators (including the Hazelwood and Yallourn power stations), the Gillard Government announced that the program would be terminated. The then Minister for Resources and Energy, the Hon. Martin Ferguson MP, said that the program's termination was due to uncertainty about whether the Government could obtain 'value for money' through the negotiation process.<sup>83</sup>

More recently, the Turnbull Government was part of negotiations for the *Paris Agreement* at the 21st Conference of the Parties of the United Nations Framework Convention on Climate Change.<sup>84</sup> The *Paris Agreement* will commit each party to reducing its emissions, with the aim of keeping 'the increase in global average temperature well below 2°C above pre-industrial levels', and ideally to 1.5°C above pre-industrial levels. Under the Agreement, governments will make commitments to greater transparency and accountability through reporting; five-yearly review of targets; strengthening societies' ability to address the impacts of climate change; and supporting developing countries to do the same. The *Paris Agreement* will be open for signature in April 2016.<sup>85</sup>

Currently, Australia has a target of reducing emissions by five per cent below 2000 levels by 2020, which equates to a 13 per cent reduction on 2005 levels.<sup>86</sup> The Turnbull Government's recent report into progress towards this target and other climate change commitments, notes that '[e]lectricity generation represents the largest share of emissions in the national greenhouse gas inventory, accounting for 33 per cent of emissions in 2014–15.'<sup>87</sup> However, during the *Paris Agreement* negotiations, the Foreign Minister, the Hon. Julie Bishop MP, indicated that 'coal-fired power generation is here to stay', as '[t]echnological breakthroughs and innovation will drive much of the change that will underpin the transition to a low-carbon economy.'<sup>88</sup>