CHAPTER 14

# Risk Assessment and Management

## 1. Introduction

### 1.1 RISK ASSESSMENT AND MANAGEMENT PURPOSE

The purpose of this chapter is to discuss the risks that have been identified in Chapter 13 and present the rigorous process undertaken to assess them. The impacts associated with each individual risk is intended to be considered against the Risk Assessment methodology proposed for this DMRP Risk Assessment scope.

This chapter includes a number of references to *Appendix B – The Post Closure Risk Management Plan*, a standalone document intended to accompany the DMRP submission that communicates the risks and proposed control management strategies which should be adopted during active and passive rehabilitation phases, as well as provide a number of ongoing risk mitigation strategies for those risks which still remain post closure into the mining licence relinquishment phase.

### 1.2 RISK ASSESSMENT SUMMARY

As discussed in Chapter 13, the purpose of the Risk Assessment was to envisage potential risks that may occur during the remaining life of the project, including the completion of the planned rehabilitation, 'active' and 'passive' rehabilitation phases, followed by the post closure period and mining licence relinquishment.

This Risk Assessment was facilitated by GHD with participation from ENGIE Hazelwood, the Mine Land Rehabilitation Authority (MLRA) and other subject matter specialists through a series of workshops. The Risk Assessment utilised the findings from the approved Risk Management Plan, Ground Control Management Plan, Fire Risk Management Plan and the 2019 Rehabilitation and Closure Plan (RCP), along with a suite of new analytical studies associated with rehabilitation and closure for the Hazelwood Mine, for the current DMRP submission.

The key objective of the rehabilitation project is to ensure that the end landform delivered will be safe, stable, sustainable and non-polluting, with as far as practical, minimal ongoing monitoring and maintenance requirements.

## 2. Risk Register

The Risk Register was prepopulated initially by referencing several ENGIE Hazelwood technical studies, previous statutory documents, the RCP of 2019 and the EES with relevant risk sources and events for the mining licence area. This register was then reviewed via a number of technical discipline workshops to align with the proposed DMRP assessment methodology and scope. Additional and missing events were then supplemented.

The Risk Register was structured to monitor the evolution of risks and provide suitable practical control mechanisms across three specific closure time horizons or phases – 'active' and 'passive' rehabilitation phases, and post closure. The associated Risk Assessment was then conducted at the end of each of these phases, once all the controls associated for the phase were employed and effective. Maximum 'credible' consequence outcomes were determined when considering the associated consequence category and then the likelihood of that consequence occurring was agreed between the team members.

Several risks triggered more than one consequence category and in this case the assessment team members selected the highest consequence outcome category to inform the assessment, with references to all potential outcomes documented in the 'potential consequence description' column of the Risk Assessment.

The applicable risk framework and criteria informing the Risk Assessment process was discussed in *Chapter 13 - Risk Identification.*

The Risk Register also included 'risk ranking assumptions' which provided an opportunity for the team members to document the reasoning, logic and any relevant input assumptions used in the assessment process. This was facilitated to ensure a high level on transparency for future readers of the assessment, enabling easier 'in-progress' reviews and to assist external stakeholders to understand the Risk Register as the Rehabilitation Project progresses across the phases and timelines.

The Risk Register includes the receptors, controls, monitoring and performance measures, along with an agreed team assessment on whether each risk, after control implementation, or during the rehabilitation phases, has been reduced to a 'so far as is reasonably practicable' level.

Please refer to the Risk Register in *Appendix I* for full details.

# 3. Risk Mitigation

Risk mitigation is the process by which a varying range of active or passive controls can be implemented to reduce the likelihood of a risk occurring and if it does occur, act to mitigate its outcome consequence. A range of possible controls are available, with a number of these discussed in the following sections.

## 3.1 CONTROLS FOR MITIGATION

Several risk controls for the active and passive rehabilitation phases, post closure and mining licence relinquishment were identified during each of the workshops, noting that for a number of the risks, extensive controls have been described in a range of supporting documents. This includes both critical and non-critical / control measures. As the team deliberated on the Risk Register during the workshops, where controls existed, these were reviewed and where controls were missing or new risks that were not previously considered, additional controls were identified by the team as potential controls including controls for the time horizons of post closure and mine relinquishment.

The controls were categorised into the following types of controls:

- **Engineering controls** – controls which do not require significant human intervention and in most cases are already in place (e.g. design, system, object)
- **Administration controls** – controls which rely on human intervention to enact, maintain or monitor the control's performance (e.g. maintenance, emergency response, monitoring)
- **Supporting documents** – the documents which outline where the controls are documented (e.g. TARPs, Procedures, Management Plans)

The number of controls gradually decreased across each of the phases, clearly demonstrating that less active intervention was required to manage risks in the long term, or that the decomposition of risks was positive, i.e. a clear reduction or complete removal, so that the need for control application was no longer warranted.

Some of the controls identified had the potential to significantly reduce the impact of risks across all three phases. These controls were typically engineering controls in design that had the ability to reduce multiple risks, reducing the outcome risk rankings across a number of sequential phases. These controls are summarised in Table 14.1.

**Table 14.1: Controls that significantly mitigated impacts of risks**

| CONTROL NAME | RISK IDS IT WAS USED TO MITIGATE | EXPLANATION |
|---|---|---|
| Capping exposed coal | 1, 2, 3, 4, 5, 14, 23, 37 | The design, maintenance and provision of capped coal mitigates the potential for coal fire events |
| Aftercare inspection of capping | 1, 2 | The maintenance and inspection of coal capping is key to mitigating the potential for coal fire events |
| Maintaining mine void with water to RL +45m within an acceptable range according to the design criteria | 1, 2, 3, 4, 5, 9, 10, 17, 33, 34, 35 | Maintaining the mine void with water mitigates instability issues with the batters in the void and mitigates fire risk as the water submerges exposed coal |
| Final landform design (e.g. batters, bench levels, pit lake, revegetation of batters) | 6, 7, 10, 11, 12, 13, 14, 15, 17, 20, 23, 25, 29, 37, 40 | The overall design of the final landform mitigates risks associated with visual amenity, environment and safety. This is because it will be designed in a way that does not impose any more of a risk or impact compared to other public water bodies. |
| Floating booms and other wave mitigation controls | 12, 15 | The wave mitigation controls assist with mitigating erosion impacts, concentration of contaminants (e.g. ash) |
| Aquifer depressurisation | 17, 18, 34 | Aquifer depressurisation will assist with unplanned or differential ground movement and uncontrolled floor heave |
| Fencing and controlled access | 5, 6, 7, 8, 14, 19, 29, 31, 32, 41 | Fencing and controls will change across the three phases, but this control mitigates risks associated with the safety impact of the community, preventing unwanted access and control of animals and livestock. |
| Water quality monitoring | 29, 30, 31. 32, 33, 34, 35, 36 | Monitoring of water quality as per sampling regime will assist with managing water quality and potential contaminations |

With these controls in place, along with all the other denoted controls for each of the risks, the associated impacts will be reduced to a level of 'so far as is reasonably practicable', noting that there is a separate section to describe the specific controls needed to mitigate risks specifically during the final phase. Please refer to **Section 3.2** on Critical Controls Selection.

## 3.2 CRITICAL CONTROL SELECTION

In addition to standard controls, Critical Controls have also been identified and have been defined within ENGIE Hazelwood's Risk Management Plan (RMP) as:

***A control that is crucial to preventing the event or mitigating the consequences of the event. The absence or failure of a critical control would significantly increase the risk despite the existence of the other controls. In addition, a control that prevents more than one unwanted event or mitigates more than one consequence is normally classified as critical.***

ENGIE Hazelwood has engaged proactively in the identification, construction and implementation of critical controls since 2016. ENGIE selected their critical controls based on the guidance provided in the *Health and Safety Critical Control Management Good Practice Guide, published by the International Council on Mining and Metals (ICMM) 2015*, representing the 'leading practice' for the management of major mining risk controls.

ENGIE Hazelwood currently have several existing critical controls nominated for the current (active rehabilitation) phase. These critical controls are relevant to ENGIE Hazelwood's proposed pit lake filling works. These were selected based on the likely threats to be encountered during the initial mine lake filling stage and were assessed as part of a number of extensive Risk Assessments using BowtieXP software tool. The process was supported by the experience of the mine operator's staff and a range of external technical discipline experts in recognising the contribution of the control to reduce the risk, either through prevention of the major nominated risk event, or mitigation of the outcome.

These existing critical controls were documented in the DMRP Risk Register as controls (highlighted in red text) and had a reference to the ID numbers listed in Table 14.2. These critical controls were reviewed and deemed to be relevant and still applicable for the first two phases of the Rehabilitation Project – Active and Passive Rehabilitation. However, new sets of critical controls were identified for the final phase – Post Closure - also currently shown in Table 14.2.

Table 14.2 describes the full list of critical controls identified in the DMRP risk assessment (including both existing and new critical controls).

### Table 14.2: List of Critical Controls Identified

| CRITICAL CONTROL | CONTROL NO | CONTROL TYPE | EFFECTIVENESS | RESPONSIBILITY | ACTIVE REHA-BILITATION | PASSIVE REHABILITA-TION | POST CLOSURE |
|---|---|---|---|---|---|---|---|
| **HAZARD: MINE FIRE** | | | | | | | |
| Plan – fire readiness (site on Low / Moderate / Severe / Extreme Days) | 0094 | Administrative | Good | Mine Production Manager | ✓ | ✓ | |
| Fire Services System – Remote / manual fire protection of exposed coal and batters | 0206 | Administrative | Good | Mine Services Superintendent | ✓ | ✓ | ✓ |
| Design and placement of suitable mineral earth to cover exposed coal i.e. roads, rehabilitation, benches | 0383 | Engineering | Satisfactory | Technical Services Manager | ✓ | ✓ | ✓ |
| Fire Services – Fire protection of exposed coal and mechanical plant (wetting down areas of exposed coal) | 0443 | Administrative | Good | Mine Production Manager | ✓ | ✓ | |
| Activate Emergency Response Plan | 0616 | Administrative | Good | Site – Security Manager | ✓ | ✓ | |
| **HAZARD: BATTER AND/OR MINE FLOOR** | | | | | | | |
| Aquifer depressurisation | 0103 | Engineering | Good | Technical Services Manager | ✓ | ✓ | |
| Design – Geometry of Batter, Bench, Surcharge Dump and Embankments | 0119 | Engineering | Very Good | Technical Services Manager | ✓ | ✓ | |
| Horizontal Drains | 0231 | Engineering | Very Good | Technical Services Manager | ✓ | | |
| Geotechnical Inspections | 0245 | Administrative | Good | Technical Services Manager | ✓ | ✓ | |
| Design and placement of suitable mineral earth to cover exposed coal i.e. roads, rehabilitation, benches | 0383 | Engineering | Satisfactory | Technical Services Manager | | | ✓ |
| Operational and Maintenance of the MMD channel and Low Flow Pipe | 0576 | Engineering | Very Good | Technical Services Manager | ✓ | | |
| Monitoring of ground movement and hydrogeological conditions by instrumentation | 0601 | Administrative | Good | Technical Services Manager | ✓ | ✓ | |
| Penstock – 3GL Water Flow (Morwell River Flood Diversion Structure) | 1107 | Engineering | N/A * | | ✓ | ✓ | |
| Maintain lake level RL+45m | 0123 | Engineering | Not Rated | | | ✓ | |
| **HAZARD: ADVERSE ENVIRONMENT** | | | | | | | |
| Aquifer depressurisation | 0103 | Engineering | Good | Technical Services Manager | ✓ | ✓ | |
| Design – Geometry of Batter, Bench, Surcharge Dump and Embankments | 0119 | Engineering | Very Good | Technical Services Manager | ✓ | ✓ | ✓ |
| Horizontal Drains | 0231 | Engineering | Very Good | Technical Services Manager | ✓ | | |
| Fire Services – Fire protection of exposed coal and mechanical plant (wetting down areas of exposed coal) | 0443 | Administrative | Good | Mine Production Manager | ✓ | | |
| Operational and Maintenance of the MMD channel and Low Flow Pipe | 0576 | Engineering | Very Good | Technical Services Manager | ✓ | | |
| Monitoring of ground movement and hydrogeological conditions by instrumentation | 0601 | Administrative | Good | Technical Services Manager | ✓ | ✓ | |
| Aquifer water quality monitoring | 1052 | Administrative | N/A * | | | ✓ | |
| **HAZARD: SITE SECURITY** | | | | | | | |
| Activate Emergency Response Plan | 0616 | Administrative | Good | Site – Security Manager | ✓ | ✓ | |
| Site Access Control | 0648 | Administrative | Good | Security and Emergency Services Manager | ✓ | ✓ | |

** N/A denotes potential critical control, 'Not Rated' denotes new critical control identified for Passive Rehabilitation phase, which does not have a critical control effectiveness rating assessed.*

## 3.3 CRITICAL CONTROL EFFECTIVENESS

As discussed in Section 3.2, ENGIE Hazelwood has proactively engaged in the identification, construction and implementation of critical controls since 2016. The existing critical controls nominated for the current active rehabilitation phase are relevant to current site conditions (including mine void water retention arrangements) and ENGIE Hazelwood's proposed pit lake filling works. These critical controls for four key risk areas are:

- Major Mine Fire
- Batter and/or Mine Floor Failure
- Security
- Adverse Environment

These current critical controls were then reviewed as part of the current tranche of Risk Assessment workshops to support the DMRP submission with their effectiveness rated on the current performance of the control. The full list of critical controls relevant for ENGIE Hazelwood across active rehabilitation, passive rehabilitation and post closure periods are included in Table 14.2.

Two critical controls were denoted as 'potential' and therefore did not have a performance standard assigned to them as they were not yet implemented onsite. These critical controls are now in the process of being updated, incorporated and supporting performance standards generated. One critical control was denoted as 'not rated' as this is a new critical control identified for the passive rehabilitation phase, not yet implemented.

For each listed critical control and where these controls are necessary for the passive and post closure periods, the associated actions for developing the associated Performance Standards have been detailed in Appendix B Post Closure Risk Management Plan.

## 3.4 DEVELOPMENT OF PERFORMANCE STANDARDS

To support each existing critical controls, Critical Control Performance Standards (CCPS) have previously been created and implemented for several risks at Hazelwood. The CCPS's are highly detailed and have been constructed by a range of internal and external stakeholders, industry professionals and subject matter experts in various supporting technical disciplines. The CCPS's site within ENGIE Hazelwood's HP Content Storage Manager document control system, which is subject to regular update and audit by internal and external parties.

Each Performance Standard is developed with details describing:

- The risk event and management of the critical controls
- The specific objectives of each critical control
- The control performance requirements, including the target performance to be achieved
- Activities which may impact and support the critical control implementation
- A nominated verification process to ensure the control is operating effectively
- A trigger for shutdown, review or investigation
- Assigned ownership and reporting accountability for escalation

With the existing performance standards identified in 2019 and aligned with the current understanding and activities needed during active rehabilitation of mine, (mine lake filling to RL+45m AHD), those critical controls for passive rehabilitation and post closure period have not been developed at this stage. For these critical controls (for passive rehabilitation and post closure period), a list of future actions has been developed to understand what needs to occur to construct and implement these performance standards when necessary. Please refer to *Appendix B – Post Closure Risk Management Plan* for more details on the applicable Performance Standards.

## 3.5 POST CLOSURE CONTROLS OVERVIEW

Following post closure, there will remain a requirement for some minor intervention to ensure risks nominated during this period are maintained to SFAIRP. During the risk workshops, controls were identified for the post closure period. These controls have been identified in Table 14.3.

Each of these controls are further explained in *Appendix B - Post Closure Risk Management Plan.* In this plan the controls needed for Post Closure will each need a clearly defined performance standard that documents who is responsible for each control and what activities are necessary to ensure its effectiveness.

### Table 14.3: Controls needed for post closure

| CONTROL | CONTROL TYPE | RELEVANT RISKS | TYPICAL MONITORING REQUIREMENTS |
|---|---|---|---|
| **HAZARD: MINE FIRE** | | | |
| Maintenance, integrity & design - capping | Administrative | **Risk 1:** Coal fire due to an external running fire<br>**Risk 2:** Coal fire due to an external ember attack<br>**Risk 5:** Coal fire caused by internal fire<br>**Risk 14:** Slope failure of overburden dump | Regular inspection and monitoring of the capping condition to maintain integrity for preventing and mitigating fire risks (e.g. capping remaining in situ throughout rehabilitation phases) |
| Emergency access routes | Administrative | **Risk 1:** Coal fire due to an external running fire<br>**Risk 2:** Coal fire due to an external ember attack<br>**Risk 3:** Vegetation fire due to lighting strike, electrical fault, human activity, external running fire, external ember attack<br>**Risk 5:** Coal fire caused by internal fire<br>**Risk 6:** Unauthorized access of member of public to site<br>**Risk 7:** Authorized access in crest | Regular inspection and housekeeping activities to ensure no obstruction on emergency access routes<br>Regular inspection to confirm signages are in place indicating clear path for emergency access routes |
| Fire breaks | Engineering | **Risk 1:** Coal fire due to an external running fire<br>**Risk 2:** Coal fire due to an external ember attack<br>**Risk 3:** Vegetation fire due to lighting strike, electrical fault, human activity, external running fire, external ember attack<br>**Risk 4:** Vegetation fire due to spontaneous combustion or hot spot<br>**Risk 5:** Coal fire caused by internal fire | Vegetation management activities to maintain vegetation growth and fire breaks |
| **HAZARD: GEOTECHNICAL** | | | |
| Maintain pit void water level | Administrative | **Risk 1:** Coal fire due to an external running fire<br>**Risk 2:** Coal fire due to an external ember attack<br>**Risk 3:** Vegetation fire due to lighting strike, electrical fault, human activity, external running fire, external ember attack<br>**Risk 4:** Vegetation fire due to spontaneous combustion or hot spot<br>**Risk 5:** Coal fire caused by internal fire<br>**Risk 9:** Geotechnical instability of in situ overburden and/or coal due to extreme seismic events<br>**Risk 10:** Geotechnical instability of in situ overburden and/or coal due to elevated ground water levels<br>**Risk 17:** Unplanned or differential ground movement due to aquifer depressurization/recovery and lake filling<br>**Risk 18:** Uncontrolled floor heave due to loss of weight balance | Regular sampling and monitoring of pit void water levels to maintain water levels at desired levels |
| Levees | Engineering | **Risk 10:** Geotechnical instability of in situ overburden and/or coal due to elevated ground water levels | Periodic inspection and monitoring of levee integrity, and perform required maintenance activities |
| Erosion Management | Administrative | **Risk 11:** Erosion leading to degradation of rehabilitated batters due to unsuitable selection of materials and design/construction<br>**Risk 12:** Erosion at shoreline due to wave action and fluctuating pit lake level<br>**Risk 13:** Erosion due to overgrazing, burrowing of animals, extreme weather event, inappropriate and/or loss of vegetation | Periodic inspection and monitoring of surface movements to track erosion through use of suitable erosion monitoring methods |
| Final landform design | Engineering | **Risk 6:** Unauthorized access of member of public to site<br>**Risk 7:** Authorized access in crest<br>**Risk 8:** Malicious acts or arson on site<br>**Risk 14:** Slope failure of overburden dump due to elevated ground water pressures, seismic event or weather event<br>**Risk 15:** Ash comes in contact with water due to an uncontrolled event relating to the HARA and the pit lake<br>**Risk 20:** Dams and watering retaining structure failure | Periodic inspection and monitoring of landform condition and changes over extended period<br>Perform regular maintenance activities to maintain final landform design / condition |
| Maintain, integrity & design - MMD | Engineering | **Risk 16:** Infiltration of water through MMD | Periodic inspection, maintenance and condition reporting of MMD<br>Periodic ground movement monitoring |
| Aquifer depressurization | Engineering | **Risk 18:** Uncontrolled floor heave due to loss of weight balance | Periodic geological monitoring and sampling of aquifer pressure in the area of interest |
| EPA Licensed Landfill Management | Administrative | **Risk 19:** EPA Licensed landfills (ash, hard rubbish & asbestos landfill) loss of containment and seepage | Regular inspection and maintenance of landfill area to maintain integrity and isolation to prevent seepage / loss of containment |

| CONTROL | CONTROL TYPE | RELEVANT RISKS | TYPICAL MONITORING REQUIREMENTS |
|---|---|---|---|
| **HAZARD: ADVERSE ENVIRONMENT** | | | |
| Pit void water quality | Administrative | **Risk 29:** Pit water body temporarily impacted due to contamination from MMD and other surface water source(s)<br>**Risk 31:** Poor water quality in the water body due to biological activity due to nutrients in source water (i.e. blue green algae)<br>**Risk 32:** Stratification of pit lake followed by a mixing event<br>**Risk 34:** Poor pit lake water quality entering M1 aquifer<br>**Risk 25:** Poor pit lake water quality entering M2 aquifer | Periodic sample of pit void water quality against pre-determined water quality targets |
| Outlet structures | Engineering | **Risk 21:** Extreme rainfall event resulting in overtopping of pit lake<br>**Risk 29:** Pit water body temporarily impacted due to contamination from MMD and other surface water source(s) | Periodic inspection, maintenance and condition reporting of outlet structures<br>Regular weather monitoring regime to monitor and predict extreme rainfall events |
| Inlet structures | Engineering | **Risk 21:** Extreme rainfall event resulting in overtopping of pit lake | Periodic inspection, maintenance and condition reporting of inlet structures<br>Regular weather monitoring regime to monitor and predict extreme rainfall events |
| Gross pollutant trap - MMD | Administrative | **Risk 16:** Infiltration of water through Morwell Main Drain (MMD)<br>**Risk 29:** Pit water body temporarily impacted due to contamination from MMD and other surface water source(s) | Periodic inspection, maintenance and condition reporting of MMD<br>Periodic ground movement monitoring |
| **HAZARD: SITE SECURITY** | | | |
| Final landform design | See above | | See above |
| Emergency access routes | See above | | See above |

*Note that the controls listed above are the initial selection based on the DMRP Risk Assessment. As time progresses and the Risk Assessment is updated in later parts of the Rehabilitation Project, the number of controls may change to adapt with new information made available.*

# 4. Risk Analysis

As discussed in *Chapter 13 - Risk Identification,* the DMRP Risk Register and supporting workshops has built on a long history of Risk Assessment at the Hazelwood mine. ENGIE Hazelwood at all stages of their operation has seen fit to employ and secure when necessary the appropriate industry professionals to identify and proactively manage all risks on site. The recent work completed by ENGIE resulted in an extensive Risk Assessment for the DMRP submission which has been provided in full in Appendix J.

## 4.1 RISK REDUCTION ANALYSIS

The risk ranking of all risks decrease as they progress through the varying time horizon phases, from active rehabilitation through to passive rehabilitation, post closure and then relinquishment However, for some items, the risk remains the same throughout the phases (low, medium or high risks), as they either typically remain a medium or high risk during all three phases, irrespective of controls or they cannot physically be reduced any further on the risk matrix beyond the 'low' risk rating.

Some risks were not able to be assessed during the active, passive rehabilitation or post closure phases, details of these are shown in Table 14.4.

**Table 14.4: Risks Not Assessed**

| ID | RISK EVENT | REMARKS / COMMENTS |
|---|---|---|
| 33 | Poor pit lake water quality entering Haunted Hills aquifer | This risk is not assessed as this is not a risk during the active rehabilitation phase. |
| 36 | Contaminated water discharges from pit lake into receiving waterways | This risk is not assessed in the active rehabilitation phase because there is no connection pathway. |
| 46 | Rehabilitated land not meeting agricultural productivity requirements | This risk is not assessed in the post closure phase though this risk remains as it is beyond ENGIE's control and will be the responsibility of the final land users. |

Risks identified and assessed for Fire, Security, Geotechnical and Environment are summarised in Table 14.5. This shows the number of risks and how they have been risk ranked, across each of the phases.

**Table 14.5: Risk Analysis Summary - Total**

| | ACTIVE REHABILITATION | PASSIVE REHABILITATION | POST CLOSURE |
|---|---|---|---|
| **Low** | 22 | 35 | 31 |
| **Medium** | 14 | 5 | 5 |
| **High** | 8 | 3 | 3 |
| **Very High** | 0 | 0 | 0 |
| **Risk Eliminated** | 0 | 3 | 6 |
| **Not Assessed** | 2 | 0 | 1 |
| **Total Risks Ranked** | 44 | 43 | 39 |

Generally, the risk profile for impacts associated with a member of public, environment and land, property and infrastructure, is relatively low. There are no risks that rank as a Very High risk. With all the proactive rehabilitation activities and supporting controls occurring during the Rehabilitation Project, risks during post closure are planned to be eliminated or mitigated to a realistic low level. Of the 39 risks which remain post closure, only 12% of risks were assessed as Medium and 7% assessed as High.

### 4.1.1 RISK ANALYSIS – FIRE

Fire is a well-known risk in the Latrobe Valley mining industry, with previous significant fires having impacted upon the sector (including the Hazelwood Mine Fire in 2014, which led to the subsequent Hazelwood Mine Fire Inquiry processes between 2014 to 2016).

The management of mine fire risk is therefore a key consideration in the context of rehabilitating the Hazelwood Mine, which has informed ENGIE Hazelwood's preferred rehabilitation option (i.e. a full pit lake landform). Therefore, the fire risk assessment conducted for the purposes of the DMRP was informed by:

- ENGIE Hazelwood's current fire protection and fire risk mitigation arrangements (including under the FRMP 2023). These arrangements reflect various operational improvements in relation to fire risk mitigation that were implemented at the Hazelwood site in accordance with the recommendations and affirmations from the HMFI processes, such as:
  - Amendments to emergency response plans to require an increased state of readiness on Total Fire Ban days and the pre-establishment of an Emergency Command Centre under certain high-risk fire conditions;
  - Development of minimum manning levels for different fire risk conditions; and
  - Other compliance arrangements implemented in response to significant legislative and regulatory reforms, such as the introduction of Fire Risk Management Plan requirements for coal mines under Schedule 8 of the MRSD Regulations.

- The expectation that mine fire risks will gradually decrease over the course of filling the Hazelwood Mine, including where a full pit lake landform is expected to passively manage these risks through the coverage of exposed coal within the mine in the long-term.

Five risks relating to fire were identified through the process, including a segregation of 'fire' risk into those risks which may present from a coal fire or vegetation fire with key differences being how these risks may materialise under varying circumstances i.e. (spot fires versus a running fire).

The highest risk assessed for the active rehabilitation was a coal fire initiated by external ember attack (Risk ID#2) which may result in potential health impacts due to smoke inhalation, amenity degradation, loss of services and infrastructure or decline in water quality. The agreed key outcome impact associated with all the fire risk scenarios was the impact to visual amenity given the likelihood of large amounts of coal burning smoke which would be generated. It was not perceived that the safety of the community would be under threat and was subsequently ranked low. Any possible community safety considerations were deemed to be highly unlikely due to the proximity of the community to remaining exposed coal areas and that the site maintained a significant security presence on site whilst active rehabilitation was taking place. This overall risk position has been significantly improved since previous risk assessments (and the published findings of the Hazelwood Mine Fire Inquiry) due to a number of proactive mitigations taken by the mine in reducing the amount of exposed brown coal. This has been predominantly achieved by filling the mine partially with water and a significant amount of mine batter rehabilitation along with a suite of improvements to the fire service system.

As the mine transitions to passive rehabilitation, post closure and relinquishment phases all coal is covered by clay, topsoiled and sown to grass or is submerged by the mine lake at RL +45m AHD, resulting in the highest risk event being a vegetation fire (Risk ID#3).

This is primarily driven by an increase in people in the area (the site is envisaged to have public access) and therefore the potential for fires started by members of the community increases whilst in addition the receptor potential also increases as more members of the public may be exposed. Discussions were had between the team members which highlighted additional control possibilities such as the consideration to restrict access on a fire danger day to assist with mitigating this risk during post closure. The details on exactly what entity would be responsible for implementing this action for the post closure and relinquishment periods is not known at this time, however it is suggested that this becomes an action to be completed either by the Local Council or the Mine Land Rehabilitation Authority.

The breakdown of the fire Risk Assessment is summarised in Figure 1.

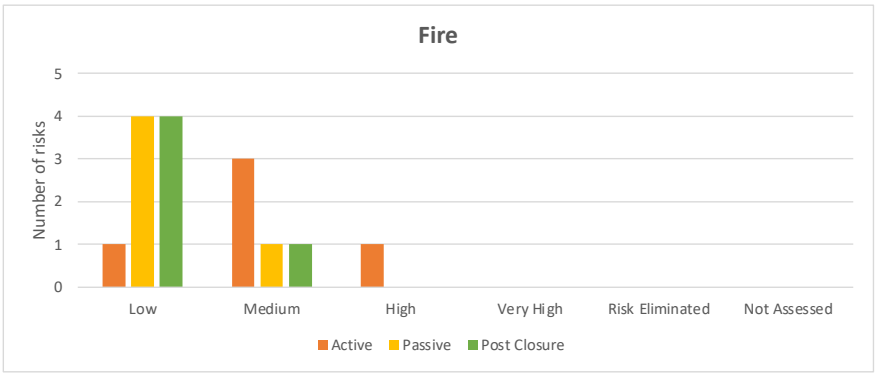


*Figure 14.1: Risk Analysis Summary - Fire*

### 4.1.2 RISK ANALYSIS – SECURITY

Three risks were identified relating to Security, which included risk events associated with unauthorised, authorised access and malicious act.

The highest risk assessed was that associated with a member of the public accessing the site unauthorised or authorised access to the mine crest. Both risk events were ranked as High for Active Rehabilitation, Passive Rehabilitation and Post Closure periods. The reason for such a high ranking is that for both scenarios a potential fatality outcome of a member of the public was believed by the workshop team members to be credible (either due to drowning, falling down steep batters during rehabilitation works or interacting with rehabilitations activities during construction). The likelihood was assessed as rare for all phases however it was noted that as the timeframe progresses, the final landform will become safer (i.e. a reduction / lowering of coal batter profile and no large operating or rehabilitating equipment will be present), and will not be any less safe compared to other public water bodies with additional standard safety control measures provided by the final land owner. As such, these risks can be assessed as SFAIRP when compared to the risks associated with any other public water body, dam or landscape.

The breakdown of the risk analysis is shown in Figure 2 below.


*Figure 14.2: Risk Analysis Summary - Security*

### 4.1.3 RISK ANALYSIS – GEOTECHNICAL

A total of ten Geotechnical risks were identified by the team, including risk events associated with geotechnical instability, erosion, HARE failure, infiltration of water through the Morwell Main Drain (MMD), differential ground movement and floor heave.

The highest rating risks for the geotechnical discipline were those associated with:

- Geotechnical instability of in situ overburden and/or coal due to extreme seismic event (Risk ID#9)
- Elevated ground water levels (risk ID#10), or infiltration of water through the MMD (risk ID#16)
- Uncontrolled floor heave due to loss of weight balance (Risk ID#18)

Once the final rehabilitated landform is achieved, a mine lake of RL+45m AHD and ground movement monitoring has confirmed that landform stability during the passive rehabilitation phase is minimal, akin to non-consequential or background movement, the highest risk during the post closure period is for unplanned or differential ground movement associated with aquifer 're'-pressurisation (Risk ID #17).

The team members discussed a period, immediately after the achievement of a RL+45m AHD mine lake, where the M1 and M2 aquifer pumps used for filling of the mine void are turned off. In this period there is an expectation that some ground movement will occur within the mining licence area. However, this increase in risk did not warrant an increase or a change in the consequence rating of Moderate or the likelihood rating of Rare. For ground movement beyond the mining licence area, particularly within the Morwell Township, differential movement may be expected as the aquifers repressurise, however the potential damage is expected to be 'within societal norms', indistinguishable to movements caused by foundations in reactive clays which shrink and swell alongside seasonal fluctuations and be within the movement tolerances of those structures. This is explained further in the WSP detailed technical reports supporting the EES.

The other high risk during the post closure is 'Uncontrolled floor heave due to loss of weight balance (Risk ID#18)'. The consequence to the environment is Moderate during the active rehabilitation phase as aquifer draw down or pumping is continuing. It is expected that any potential heave during this period would be more localised and contained within the mine void. However, as the aquifer repressurises during the passive and post closure periods, with the aquifer pump network turned off, the aquifers will repressurise acting to increase uplift pressures exerted on the floor of the mine. It is expected from the detailed work completed as part of the EES, that full aquifer recovery and pressures will occur at some point approximately 200 years into the future. As a result, the post closure risk is rated as a High albeit with an accompanying likelihood of rare.

The breakdown of the risk analysis is shown in Figure 3.

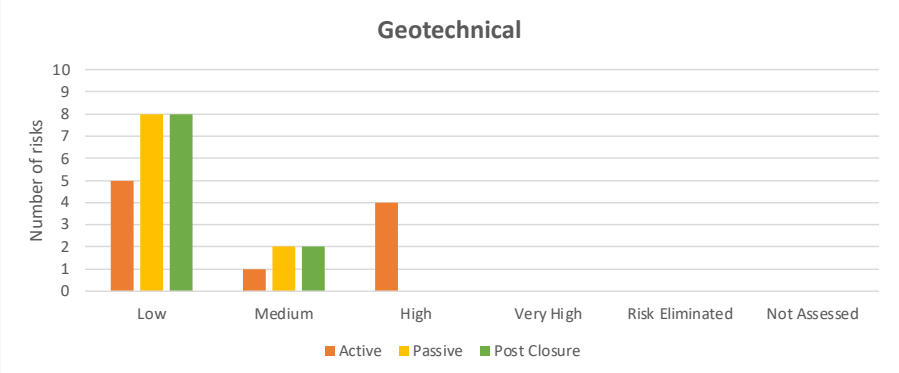


*Figure 14.3: Risk Analysis Summary - Geotechnical*

### 4.1.4 RISK ANALYSIS – ENVIRONMENT

The highest number of risks is associated with the Environment category, with a total of 28 risks identified.

The highest ranked environment risk during active rehabilitation is associated with EPA Licensed landfills contamination and seepage (Risk ID#19). This is driven by the consequence rating of Critical, as potential leachate sources have a low likelihood of causing deleterious impacts to members of the community who are in close proximity to the landfills and may come into contact with them. The workshop team members all believed that the likelihood of such an event occurring is Rare. It was agreed that this risk rating would not change even with the implementation of the slated controls acting to restrict access around the landfill and the installation of appropriate landfill capping in accordance with the EPA license requirements.

This was agreed as the landfill itself cannot be eliminated from the mine surrounds and therefore the consequence cannot be modified. With the likelihood already as low as possible, this risk was considered by the team members as being reduced SFAIRP.

During the post closure period, 64% of the risks identified are rated as 'Low' as they are all inherently low risk to the community, environment and infrastructure. During the Rehabilitation Project 21% of risks will be able to be eliminated, please refer to Section 4.3 for more information on the eliminated risks. This demonstrates that through ENGIE's adopted rehabilitation strategy and accompanying controls that even though the environment category predominately has the most risks, they are all inherently Low for post closure period.

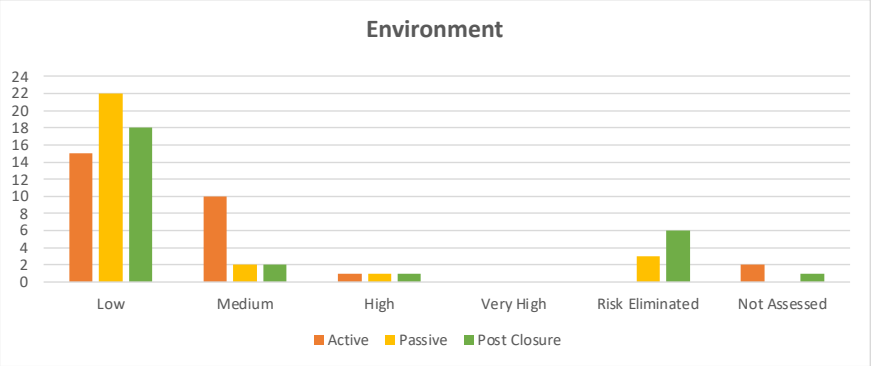


*Figure 14.4: Risk Analysis Summary - Environment*

## 4.2 ELIMINATED RISKS

Of the risks assessed, six risks will be eliminated during passive rehabilitation or post closure phases. These risks are summarised below with an explanation provided on why they were eliminated. Note that these risks all fall in the category of Environment.

**Table 14.6: Eliminated risks**

| ID # | RISK | PHASE RISK WAS ELIMINATED | EXPLANATION |
|---|---|---|---|
| 22 | Acid Sulphate Soils (ASS) resulting from 1) Exposure of ASS during construction, 2) Inundation and mobilisation of ASS during water table recovery | Passive Rehabilitation | In the passive rehabilitation phase, it is anticipated that all rehabilitation works have completed, and no further excavation activities will occur. As such, the risk of exposure to acid sulphate soils is eliminated. |
| 24 | Generation of noise & vibration from rehabilitation works | Post Closure | There are no rehabilitation or major maintenance activities that could result in offsite noise and vibration impact during the post closure phase, therefore the risk is eliminated. This is in line with the findings from the EES Noise & Vibration Technical Assessment. |
| 25 | Visual amenity impacts from rehabilitation works (e.g. light, visual) | Post Closure | This risk is eliminated during post closure phase as the visual landscape of the rehabilitated land will form part of the final landform which will blend into the surrounding lands. |
| 27 | Greenhouse gas generated on site | Post Closure | During post closure there will be no need for greenhouse gas emitting equipment. As such, the risk is eliminated. |
| 30 | Water quality degrades in the pit lake due to geochemical reactions within pit such as acid generation, leaching of contaminants from HARA | Passive Rehabilitation | In the passive rehabilitation phase, all coal is either submerged and/or capped. As such, the interaction with coal has ceased and therefore risk is eliminated in the passive rehabilitation phase. |
| 43 | Rehabilitation activities adversely affect known / unknown historic heritage values | Passive Rehabilitation | There are no earthworks present in the passive rehabilitation phase and all identified historical heritage sites will have been identified and removed during the active rehabilitation phase. As such, this risk is eliminated. |

## 4.3 ALIGNMENT TO EES IDENTIFIED RISKS

The EES Risk Register is a detailed Risk Assessment, commissioned as part of the EES by ENGIE Hazelwood and identifies possible risks from the planned rehabilitation process that may impact a number of environmental receptors. The environmental risks are broken into the following categories:

- Aboriginal and cultural heritage
- Air quality
- Ecology
- Groundwater
- Historic heritage
- Land and soil waste
- Land use planning
- Landscape and visual
- Noise and vibration
- Socioeconomic
- Transport
- Water resource use and regulation

These categories show a further level of detail specifically looking at the broader environment category within the DMRP Risk Register. Each of the relevant risks were aligned to the risks highlighted in the DMRP Risk Register (refer to the final column in the DMRP Risk Register). In some instances, there are numerous EES risks aligned to a single DMRP risk. This is because the DMRP risk is assessed laterally across each phase of rehabilitation time horizon, whereas the EES risk will have a new line item for each risk, in each phase, with one receptor and one source. The information provided for each identified risk was checked to ensure consistency between the EES risk process and the DMRP process. The EES register does however include more specific controls that refer to detailed studies on specific environmental receptors which is outside the scope for this 'mining licence only' Risk Assessment.

# 5. Conclusion

The DMRP Risk Register has been developed to identify risks to community, environment and infrastructure. The risk profile for impacts associated with a member of public, the environment and land, property & infrastructure is overall, relatively low. There are no risks that rank as a Very High risk. With the mine filled to a level of RL+45m AHD and the aforementioned controls implemented risks during post closure are planned to be eliminated or mitigated to a low level, with only 12% of risks assessed as Medium and 7% assessed as High. The DMRP Risk Register has also been incorporated into the other relevant Risk Registers which ENGIE Hazelwood retain including the Stability Risk Register (within the GCMP), the Fire Risk Register (in the FRMP) and the Environmental Risk Register (in the EMS). This ensures ENGIE Hazelwood maintains its documentation consistency across all relevant management documents.

Please refer to **Appendix B** for the Post Closure Risk Management Plan for further details on the controls and their performance.