APPENDIX N

Preliminary Hazard Analysis

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1 INTRODUCTION

The Dendrobium Mine is an underground coal mine situated in the Southern Coalfield of New South Wales (NSW) approximately 8 kilometres (km) west of Wollongong (Figure 1).

This Preliminary Hazard Analysis (PHA) forms part of an Environmental Impact Statement (EIS), which has been prepared to accompany a State Significant Infrastructure (SSI) Application for the Dendrobium Mine Extension Project (the Project) in accordance with Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act), as the Project was declared as SSI by the Minister for Planning and Public Spaces in December 2021.

The Secretary of the Department of Planning and Environment has provided the following Secretary's Environmental Assessment Requirements (SEARs) that may be relevant to the PHA:

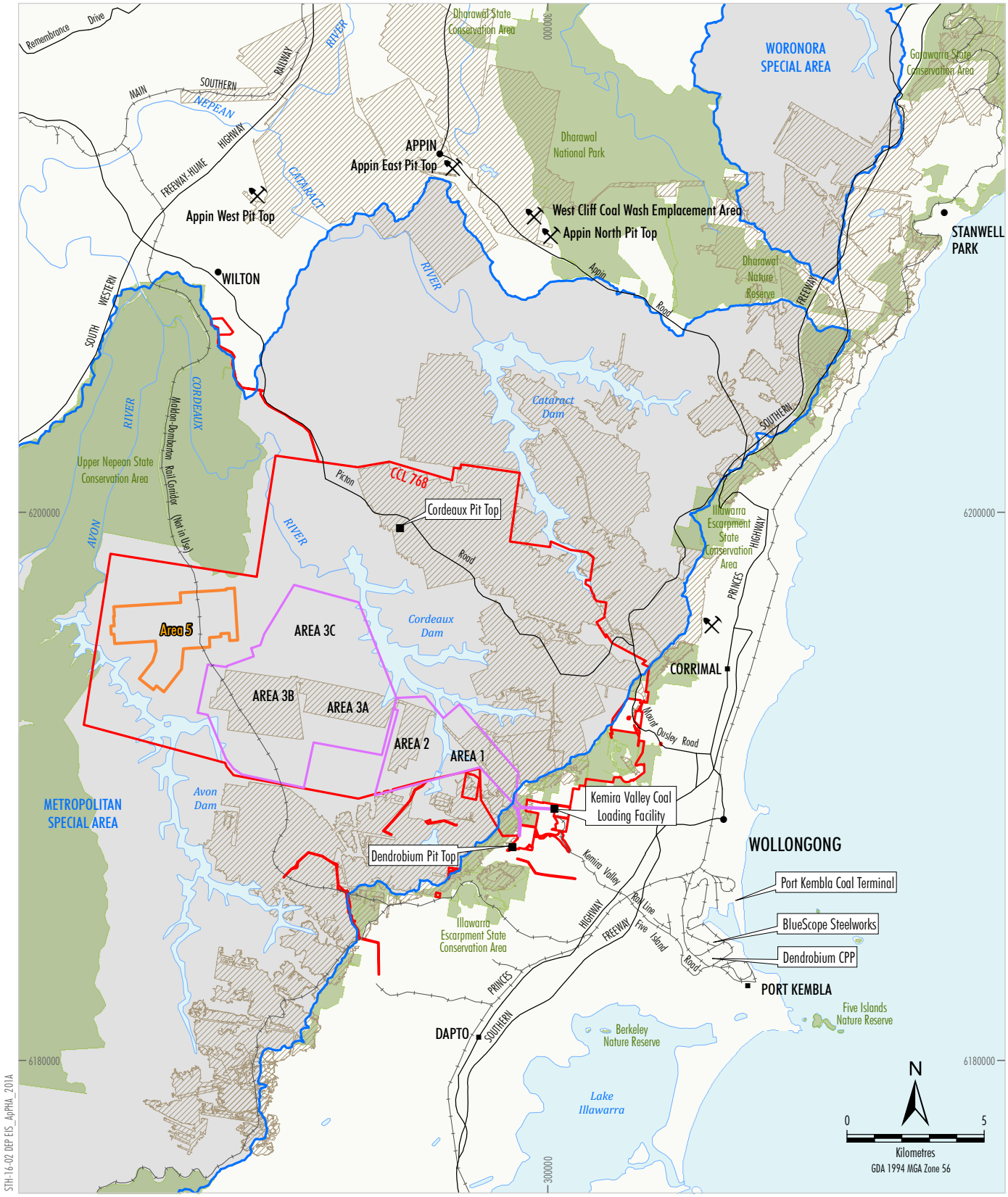
> ***11. Hazard and Bushfire*** *– including:*
>
> - *an assessment of the likely risks to public safety, paying particular attention to potential subsidence risks, bushfire risks, and the handling and use of any dangerous goods;*
> - *an assessment of bushfire risk, including consideration of the impacts of climate change and predicted subsidence-related hydrological changes within the local landscape; and*
> - *consideration of State Environmental Planning Policy 33 – Hazardous and Offensive Development with clear justification to support any conclusion that SEPP 33 does not apply.*

Consistent with the SEARs, this PHA addresses hazards relating to dangerous goods and bushfires. Public safety risks associated with subsidence are considered in the Subsidence Assessment (Appendix A of the EIS) and the Environmental Risk Assessment (ERA) (Appendix M of the EIS), climate change is considered in the Greenhouse Gas Assessment (Appendix R of the EIS) and subsidence-related hydrological changes are considered in the Groundwater Assessment (Appendix B of the EIS) and Surface Water Assessment (Appendix C of the EIS).

Under Part 5 of the EP&A Act, Environmental Planning Instruments (including State Environmental Planning Polices [SEPP]) do not apply, however, this PHA has been prepared in consideration of:

- the general principles of risk evaluation and assessment outlined in the NSW Government's *Multi-level Risk Assessment Guideline* (Department of Planning and Infrastructure [DP&I], 2011);
- the requirements of the Chapter 3 of the *State Environmental Planning Policy (Resilience and Hazards) 2021* (Resilience and Hazards SEPP) (previously the *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* [SEPP 33]);
- *Applying SEPP 33 - Hazardous and Offensive Development Application Guidelines* (NSW Department of Planning [DoP], 2011a);
- *Hazardous Industry Planning Advisory Paper (HIPAP) No. 6: Hazard Analysis* (HIPAP No. 6) (DoP, 2011b); and
- *Planning for Bushfire Protection 2019* (NSW Rural Fire Service, 2019).

Assessed risks have been compared to qualitative risk assessment criteria developed in consideration of the International Organisation for Standardisation (ISO) 31000:2018 *Risk Management – Guidelines*, and *HIPAP No. 4: Risk Criteria for Land Use Safety Planning* (HIPAP No. 4) (DoP, 2011c).



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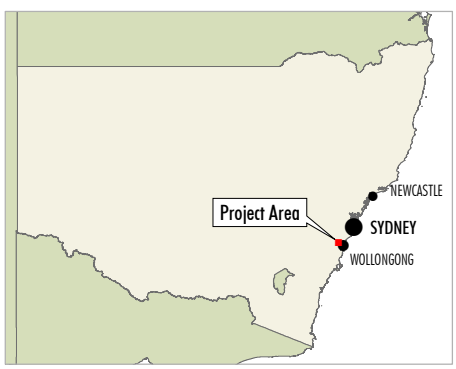


LEGEND

- Dendrobium Mining Lease
- Road
- Railway
- National Park, Nature Reserve and State Conservation Area
- Historic Mine Workings
- Declared Catchment Area
- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)
- Dendrobium Underground Mining Area - Extension Project

Source: Geoscience Australia, (2006); Department of Industry (2018); Department Finance, Services & Innovation (2018);

SOUTH32

Illawarra Coal

DENDROBIUM MINE

Regional Location

Figure 1

1.1 OVERVIEW OF THE DENDROBIUM MINE

The Dendrobium Mine is an underground coal mine situated in the Southern Coalfield of NSW approximately 8 km west of Wollongong (Figure 1).

Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal [IMC]), a wholly owned subsidiary of South32 Limited (South32), is the owner and operator of the Dendrobium Mine.

Development Consent DA 60-03-2001 for the Dendrobium Mine was granted by the NSW Minister for Urban Affairs and Planning under the EP&A Act in November 2001.

The Dendrobium Mine extracts coal from the Wongawilli Seam (also known as the No 3 Seam) within Consolidated Coal Lease (CCL) 768 using underground longwall mining methods. The Dendrobium Mine includes five approved underground mining domains, named Areas 1, 2, 3A, 3B and 3C. Longwall mining is currently being undertaken in Area 3B, with extraction largely complete in Areas 1, 2 and 3A (Figure 1).

The Dendrobium Mine has an approved operational capacity of up to 5.2 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal until 31 December 2030.

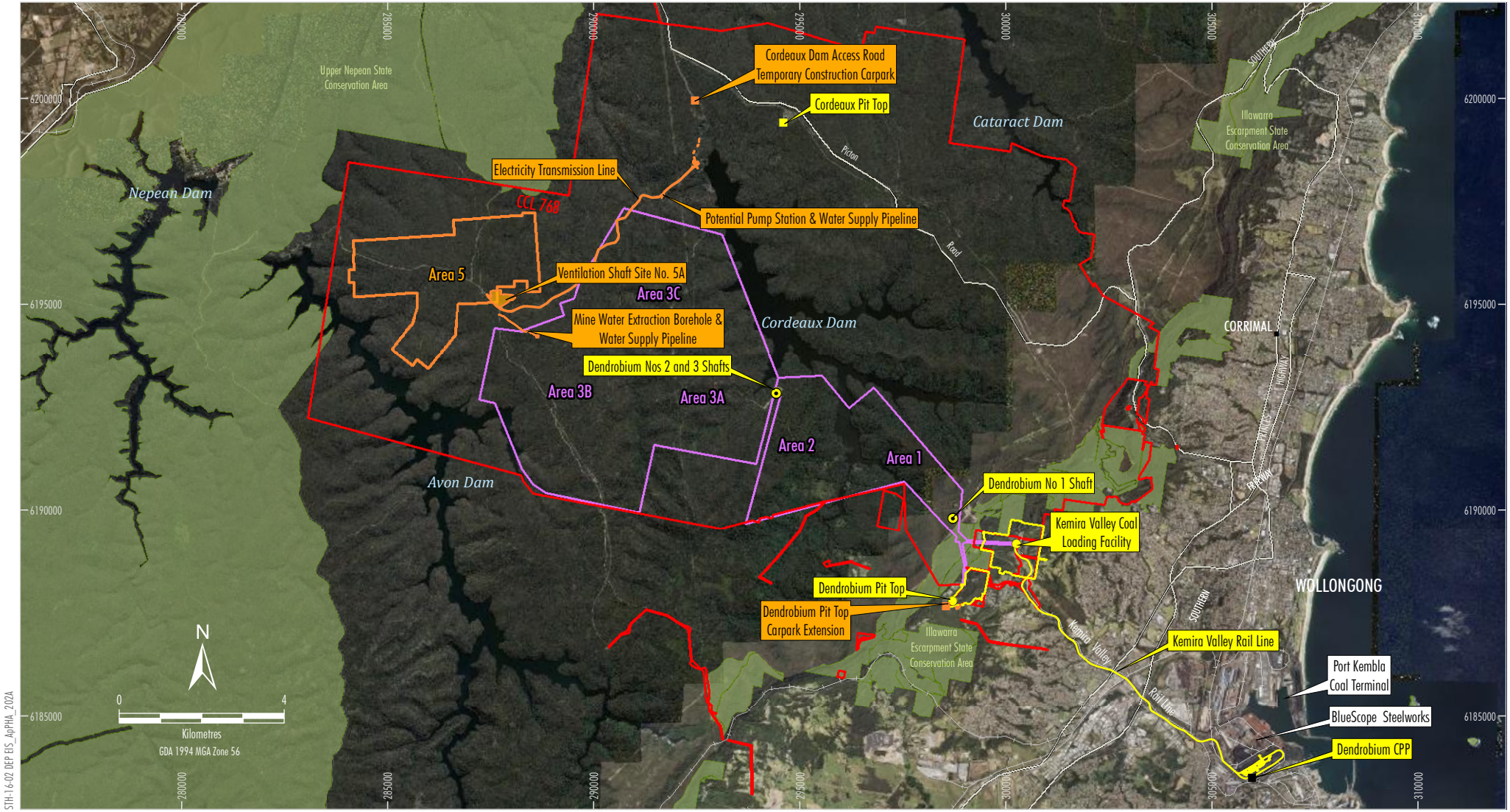
1.2 OVERVIEW OF THE PROJECT

IMC is seeking Infrastructure Approval for the Project, which would support the extraction of approximately 31 million tonnes of ROM coal from Area 5 (Figure 2), within CCL 768. The life of the Project includes longwall mining in Area 5 up to approximately 31 December 2034, and ongoing use of existing surface facilities for handling of Area 3C ROM coal until 2041[1].

The Project would include the following activities:

- longwall mining of the Bulli Seam in a new underground mining area (Area 5);
- development of underground roadways from existing Dendrobium Mine underground areas (namely Area 3) to Area 5;
- use of existing Dendrobium Mine underground roadways and drifts for personnel and materials access, ventilation, dewatering and other ancillary activities related to Area 5;
- development of new surface infrastructure associated with mine ventilation and gas management and abatement, water management and other ancillary infrastructure;
- handling and processing of up to 5.2 Mtpa of ROM coal (no change from the approved Dendrobium Mine);
- extension of underground mining operations within Area 5 until approximately 31 December 2034;
- use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Dendrobium Coal Preparation Plant (CPP) and Dendrobium Shafts with minor upgrades and extensions until approximately 2041;
- transport of ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line;

[1] The Project does not include approved underground mining operations in the Wongawilli Seam in Areas 1, 2, 3A, 3B and 3C at the Dendrobium Mine and associated surface activities (such as monitoring and remediation). These activities will continue to operate in accordance with Development Consent DA 60-03-2001 (as modified).



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LEGEND

- Dendrobium Mining Lease
- Road
- Railway
- National Park, Nature Reserve and State Conservation Area

Dendrobium Mine

- Dendrobium Underground Mining Area - Existing Mine (DA 60-03-2001)

Dendrobium Mine Extension Project

- Dendrobium Underground Mining Area - Extension Project
- Surface Facilities (Existing Dendrobium Mine)
- Surface Facilities (Proposed Dendrobium Mine Extension Project)

Source: Geoscience Australia, (2006); Department of Industry (2018); Department Finance, Services & Innovation (2018);

SOUTH32
Illawarra Coal

DENDROBIUM MINE

General Arrangement
Dendrobium Mine Extension Project

Figure 2

- handling and processing of coal from the Dendrobium Mine (including the Project) and IMC's Appin Mine (if required) to the Dendrobium CPP to 2041;
- delivery of coal from the Dendrobium CPP to Port Kembla for domestic use at the Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks or export through the Port Kembla Coal Terminal;
- transport of coal wash by road to customers for engineering purposes (e.g. civil construction fill) for other beneficial uses and/or for emplacement at the West Cliff Stage 3 and/or Stage 4 Coal Wash Emplacement;
- development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement (noting that opportunities for beneficial use of coal wash would be maximised);
- continued use of the Cordeaux Pit Top for mining support activities such as exploration, environmental monitoring, survey, rehabilitation, administration and other ancillary activities;
- progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure,;
- controlled release of excess water in accordance with the conditions of Environmental Protection Licence (EPL) 3241 and/or beneficial use;
- monitoring, rehabilitation and remediation of subsidence and other mining effects; and
- other associated infrastructure, plant, equipment and activities.

1.3 OBJECTIVE AND SCOPE

For this PHA, the 'site' is considered to comprise the extent of surface facilities (i.e. proposed new surface facilities for the Project and approved surface facilities at the Dendrobium Mine) and the underground mining area proposed to be used as part of the Project (i.e. Area 5). The Project underground mining area as well as a number of proposed surface facilities are located within the Metropolitan Special Area.

The objective of this PHA is to identify the off-site risks posed by the proposed Project to people, their property and the environment, and assess the identified risks using relevant qualitative criteria. In accordance with the *Multi-level Risk Assessment Guideline* (DP&I, 2011), this assessment specifically covers risks from fixed installations and does not encompass off-site transportation by road, rail, air, sea or pipeline.

The PHA, therefore, considers off-site risks to people, property and the environment (in the presence of controls) arising from atypical and abnormal hazardous events and conditions (e.g. equipment failures, operator error and external events), with specific focus on fixed installations on-site. This assessment does not consider risks to IMC employees or IMC owned property, or risks that are not atypical or abnormal (e.g. long-term effects of typical dust emissions).

On-site environmental risks and potential long-term impacts are considered in the ERA (Appendix M of the EIS) and in a range of specialist studies conducted for the EIS (Appendices A to L and O to S]). The following Appendices were included in the EIS:

- Appendix A – Subsidence Assessment.
- Appendix B – Groundwater Assessment.
- Appendix C – Surface Water Assessment.

- Appendix D – Biodiversity Development Assessment Report.
- Appendix E – Aquatic Ecology Assessment.
- Appendix F – Aboriginal Cultural Heritage Assessment.
- Appendix G – Historical Heritage Assessment.
- Appendix H – Road Transport Assessment.
- Appendix I – Air Quality and Greenhouse Gas Assessment.
- Appendix J – Noise and Blasting Assessment.
- Appendix K – Social Impact Assessment.
- Appendix L – Economic Assessment.
- Appendix M – Environment Risk Assessment.
- Appendix N – Preliminary Hazard Analysis.
- Appendix O – Land Contamination Assessment.
- Appendix P – Geological Structure Review.
- Appendix Q – Mine Closure Study.
- Appendix R – Greenhouse Gas Assessment.
- Appendix S – Geotechnical Assessment.

1.4 PRELIMINARY SCREENING PROCESS

Preliminary screening to determine the requirement for a PHA was undertaken for the Project, taking into account broad estimates of possible off-site consequences or effects from hazardous materials present on-site and their locations. “Potentially hazardous industry” is defined by Chapter 3 of the Resilience and Hazards SEPP as a development for the purposes of industry, that if it were not to apply the necessary controls to minimise the overall effect on the surrounding environment, it would pose significant risk to people, property, and the biophysical environment.

In accordance with the *Multi-level Risk Assessment Guideline* (DP&I, 2011), it was determined the Project is potentially hazardous, as the possibility of harm to the off-site environment (e.g. including public and property) in the absence of controls could not be discounted.

According to the *Multi-level Risk Assessment Guideline* (DP&I, 2011), a Level 1 assessment (qualitative analysis) can be justified if all, or most, of the following conditions are met:

- the analysis of the facility demonstrates there are no major off-site risks;
- the technical and management controls are well understood and readily implemented; and
- there are no sensitive surrounding land uses.

The PHA review team (Section 1.5.1) reviewed this screening process and concluded there is limited potential for scenarios with significant off-site consequences or effects, and the technical and management controls are well understood and readily implemented. In addition, given there are generally no sensitive surrounding land uses (noting that the Dendrobium Pit Top has coexisted with proximal residential areas), the team implemented a Level 1 assessment (qualitative analysis) for this PHA.

1.5 STUDY METHODOLOGY

The following methodology was employed during the preparation of this PHA:

1. Identify the potential hazards associated with the Project.
2. Analyse the consequences or effects of identified hazardous events.
3. Qualitatively estimate the likelihood of the identified hazardous events.
4. Propose risk treatment measures for the identified hazardous events.
5. Qualitatively assess risks to the environment, members of the public and their property arising from atypical and abnormal events, and compare to the risk criteria outlined in HIPAP No. 4 (DoP, 2011b).
6. Propose further risk treatment measures, if necessary.
7. Qualitatively determine the residual risk assuming the implementation of proposed risk treatment measures.

1.5.1 Preliminary Hazard Analysis Review Team

The above methodology was implemented in November 2021 during a PHA team-based risk review. The review participants included technical advisors from IMC including:

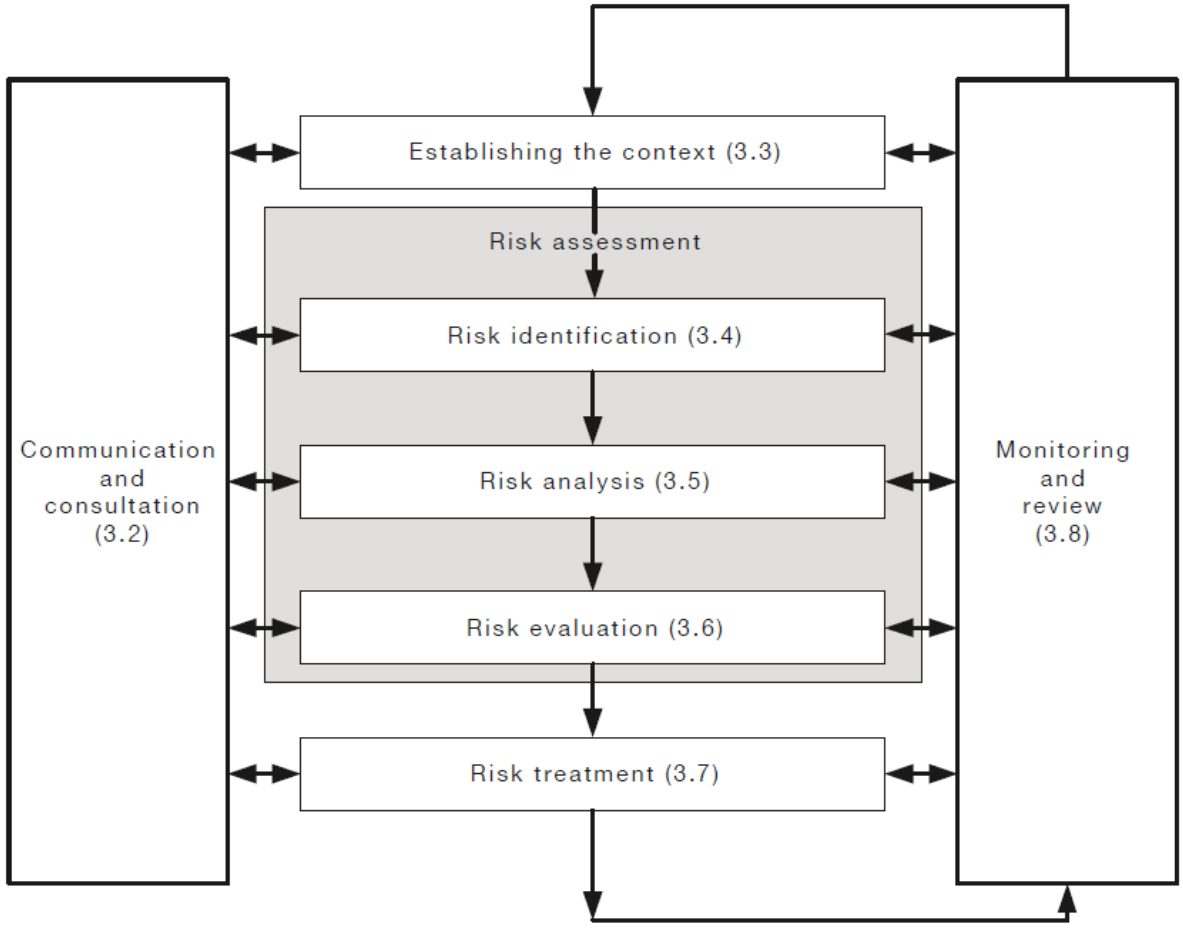
- Gary Brassington – Manager Approvals.
- Chris McEvoy – Approvals Manager Dendrobium Mine Extension Project.
- Chris Schultz – Superintendent Environment.
- Garry Morrisey – Manager HSE & Risk (Major Projects).

1.5.2 Risk Management Process

This PHA has been undertaken in consideration of the risk management process described in ISO 31000:2018. The risk management process is shown schematically on Figure 3 and includes the following components:

- Establish the context (Section 1).
- Identify risks (Section 2.2 and Attachment A).
- Analyse risks (Section 3 and Attachment A).
- Evaluate risks (Section 3 and Attachment A).
- Treat risks (Section 2.2.3 and Attachment A).

Figure 3 – Risk Management Process



Source: Standards Australia and Standards New Zealand (2012).

1.5.3 Risk Criteria

This PHA considered the following qualitative criteria (DoP, 2011b):

(a) *All 'avoidable' risks should be avoided. This necessitates investigation of alternative locations and technologies, wherever applicable, to ensure that risks are not introduced in an area where feasible alternatives are possible and justified.*

(b) *The risks from a major hazard should be reduced wherever practicable, irrespective of the value of the cumulative risk level from the whole installation. In all cases, if the consequences (effects) of an identified hazardous incident are significant to people and the environment, then all feasible measures (including alternative locations) should be adopted so that the likelihood of such an incident occurring is made very low. This necessitates the identification of all contributors to the resultant risk and the consequences of each potentially hazardous incident. The assessment process should address the adequacy and relevance of safeguards (both technical and locational) as they relate to each risk contributor.*

(c) *The consequences (effects) of the more likely hazardous events (i.e. those of high probability of occurrence) should, wherever possible, be contained within the boundaries of the installation.*

(d) *Where there is an existing high risk from a hazardous installation, additional hazardous developments should not be allowed if they add significantly to that existing risk.*

1.5.4 Qualitative Measures of Consequence, Likelihood and Risk

To undertake a qualitative risk assessment, it is useful to define the various levels of consequences of a particular event, as well as the likelihood (probability) of the event occurring. The risk assessment consequence and likelihood descriptors were developed during the 'Establish the Context' phase of the Risk Management Process (Section 1.5.2) in accordance with ISO 31000:2018.

In accordance with ISO 31000:2018, Tables 1, 2 and 3 were reviewed by the team and were considered to be consistent with the specific objectives and context of this PHA.

The hazard identification table (Attachment A) illustrates the systematic application of the above criteria for the hazardous events identified for the Project.

Table 1
Qualitative Measures of Probability

Event	Likelihood	Description
10	Almost Certain	Could be expected to occur more than once during the study or project.
3	Likely	Could easily be incurred and has generally occurred in similar studies or projects.
1	Possible	Incurred in a minority of similar studies or projects.
0.3	Unlikely	Know to happen, but only rarely.
0.1	Rare	Has not occurred in similar studies or projects, but could.
0.03	Very Rare	Conceivable, but only in extreme circumstances.

Table 2
Qualitative Measures of Maximum Reasonable Consequence

Estimated Level of Consequence	Area of Effect			
	Harm to People	Environmental	Community	Financial
1	Low-level short-term subjective symptoms or inconvenience. No medical treatment.	Low-level impact to land, biodiversity, ecosystem services, water resources or air.	Single low-level community health, safety or security impact, low-level inconvenience <2 weeks, minor, low-level disturbance to a single house or structure.	Less than US$500,000 loss or production delay.
3	Objective but reversible impairment. Medical treatment, injury or illness.	Minor impacts (<3 months) to land, biodiversity, ecosystem services, water resources or air.	Minor community health, safety or security impacts (<10 households) or human rights infringements, inconvenience to livelihoods <6 months, moderate damage to <50 houses or community infrastructure.	US$5,000,000 to US$500,000 loss or production delay.
10	Permanent impairment <30% of body to one or more persons.	Moderate impacts (<1 year) to land, biodiversity, ecosystem services, water resources or air.	Moderate community health, safety or security impacts (<50 households). Single allegation of human rights violations, moderate disruption to people's lives (<50 households).	US$25,000,000 to US$5,000,000 loss or production delay.
30	Single fatality. Permanent impairment >30% of body to one or more persons.	Major impacts (<5 years) to land, biodiversity, ecosystem services, water resources or air.	Serious community health, safety or security impacts (<50 households). Multiple allegations of human rights violations, extended disruption to people's lives (>50 households).	US$100,000,000 to US$25,000,000 loss or production delay.
100	2-20 fatalities. Permanent impairment >30% of body to more than 10 persons.	Serious or extensive impacts (<20 years) to land, biodiversity, ecosystem services, water resources or air.	Serious community health, safety or security impacts (>50 households) or human rights violation, extended disruption to people's lives (>200 households).	US$250,000,000 to US$100,000,000 loss or production delay.
300	>20 fatalities. Permanent impairment >30% of body to more than 100 persons.	Severe impacts (>20 years) to land, biodiversity, ecosystem services, water resources or air.	Extensive community health, safety or security impacts (>200 households) or human rights violations, extended serious disruption to people's lives (>1000 households).	Greater than $250,000,000 loss or production delay.

Table 3
Risk Ranking Table

Likelihood Factor	Consequence (Impact Factor)					
	Low 1	Minor 3	Moderate 10	Significant 30	Major 100	Catastrophic 300
10 Almost Certain	10	30	100	300	1,000	3,000
3 Likely	3	9	30	90	300	900
1 Possible	1	3	10	30	100	300
0.3 Unlikely	0.3	0.9	3	9	30	90
0.1 Rare	0.1	0.3	1	3	10	30
0.03 Very Rare	0.03	0.09	0.3	0.9	3	9

2 HAZARD IDENTIFICATION

The potential hazards associated with the Project would include the storage and handling of hydrocarbons, chemicals and explosives. A brief description of these materials is presented below. The description below focuses on the existing facilities associated with the Dendrobium Mine that would continue to be used for the Project, and additional facilities proposed for the Project where relevant.

In addition, the stockpiling of ROM and product coal has also been considered in this PHA.

2.1 DESCRIPTION OF HAZARDOUS MATERIALS

The transportation, handling and storage of all dangerous goods for the Project would be in accordance with the NSW *Work Health and Safety Regulation 2017*.

2.1.1 Hydrocarbons

Hydrocarbons used on-site would include fuels (i.e. diesel and petrol), Liquified Petroleum Gas, oils, greases, solcenic fluid, degreaser and kerosene. Hydrocarbon storage facilities would be operated in accordance with the requirements of Australian Standard (AS) 1940:2017 *The storage and handling of flammable and combustible liquids*.

The storage and handling of diesel, petrol and oil would be in accordance with AS 1940:2017, dependent on their classification. Diesel is classified by AS 1940:2017 as a combustible liquid (Class 1) for the purpose of storage and handling. For transport purposes, diesel is not classified as a dangerous good by the criteria set in the Australian Dangerous Goods Code (ADG Code), as it has a flashpoint between 60 and 150 degrees Celsius (National Transport Commission, 2017). Petrol is classified as a flammable liquid (Class 3) by AS 1940:2017 and is, therefore, a dangerous good, according to the criteria of the ADG Code. Oil is classified by AS 1940:2017 as a combustible liquid (Class C2). There is currently no bulk petrol storage on site and no proposal for bulk petrol storage on site.

There are two existing bunded areas for hydrocarbon storage at Dendrobium Pit Top that would be used for the Project. Two bulk chemical storage containers within the bunded areas, one for solcenic fluid (a hydraulic lubricant) storage and one for diesel storage, would be utilised by the Project. There is transient oil storage associated with the site workshops and waste oil facilities. Portable bunds are used to store and transport hydrocarbons along the portal road.

Two existing hydrocarbon bunded areas at the Dendrobium CPP would continue to be used, including a Methyl iso-Butyl Carbinol storage tank and a diesel storage tank. A small grease and oil storage area is also maintained within the main Dendrobium CPP building.

The existing underground bulk diesel storage tank at the Cordeaux Pit Top would continue to be used for the Project. The storage tank would be managed in accordance with the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019* (or equivalent).

For the Project, if required, and in addition to the permanent bunded areas, portable bunds would be utilised for the transportation or transient storage of fuels and oils around the surface facilities. The usage of petrol on-site would be minor and petrol-fuelled vehicles would primarily be refuelled off-site at local service stations.

The type and quantities of hydrocarbons stored on-site would continue to be documented in the relevant Pollution Incident Response Management Plan prepared under the *Protection of the Environment Operations (General) Regulation 2021*.

2.1.2 Chemicals

The management and storage of chemicals for the Project would be conducted in accordance with IMC's prescribed management procedures, AS (e.g. *The storage and handling of corrosive substances* [AS 3780-2008]) and codes.

Chemical storage areas would be separated according to chemical type and storage requirements. IMC would continue to assess new substances before their use on-site by completing a substance evaluation form and risk assessment (if required). Safety Data Sheets and substance evaluations would be available to site personnel.

All chemicals brought on-site would be recorded in a register, which identifies the type of product, dangerous goods class, liquid class, hazardous chemical class and the quantity held on-site. The inventory register also identifies the compatibility of materials and the emergency response procedures in the event of a spill.

2.1.3 Explosives

Explosives would be stored in existing explosive storage facilities at the Dendrobium Pit Top for designated uses if the operations or an emergency required the use of explosives.

Explosives storage would be conducted in accordance with the NSW *Explosives Act 2003* and *Explosives Regulation 2013*. The *Explosives Regulation 2013* details the requirements for the safe storage, land transport and handling, and disposal of the explosive, with reference to AS 2187.2:2006 *Explosives – Storage and Use – Use of Explosives* for specific guidelines.

The storage of explosives on-site would be in limited quantities and within the conditions under the Licence to Store Explosives currently in place at the approved Dendrobium Mine.

2.1.4 Liquid and Non-Liquid Wastes

Solid and hazardous waste generated at the existing Dendrobium Mine is removed from the site and disposed of by a licensed contractor. Contaminated waste or asbestos (if identified) would require further assessment and advice to be sought regarding waste classification, handling, treatment, disposal and reporting requirements prior to appropriate licenced disposal.

General solid waste (e.g. timber, paper, steel, food waste, etc.) produced by the Project at surface facilities would be disposed of by a licensed waste contractor, and waste produced at the underground mining areas would be transported to an off-site approved waste handling facility for sorting and recycling or disposal.

Used tyres would be segregated and collected either for repairs (if possible) or for disposal by a licensed waste contractor.

Sewage would continue to be plumbed into the town sewerage system from the Dendrobium Pit Top and Dendrobium CPP. At Cordeaux Pit Top sewage effluent produced on-site would be held in the sewage holding tank, prior to being removed by a licensed waste contractor.

Wastewater from bathhouses at the Dendrobium Pit Top would be treated at the on-site water treatment facility. Treated bathhouse water is directed underground for recycling.

2.2 HAZARD IDENTIFICATION PROCESS

2.2.1 Project Components

As this assessment specifically covers risks from fixed installations associated with the Project (in accordance with *Multi-level Risk Assessment Guideline* [DP&I, 2011] [Section 1.3]), the main focus of this assessment is on on-site storages, coal stockpile areas, water management structures and ventilation and gas management infrastructure. Some additional risks relating to mining operations (e.g. unplanned/unauthorised movement of mobile plant off-site) were identified and included in this PHA. While transportation is not covered by the *Multi-level Risk Assessment Guideline* (DP&I, 2011) (Section 1.3), potential risks associated with on-site rail movements have also been considered. Further discussion on the scope and objectives of this PHA are described in Section 1.3.

2.2.2 Incident Classes

The following classes of incidents were identified:

- spill/leak;
- fire;
- explosion;
- excessive vibration or overpressure;
- flyrock;
- unauthorised movement of mobile plant;
- theft;
- water or fine reject storage embankment failure;
- malfunction of equipment/mine infrastructure;
- malicious acts/terrorism; and
- release of disease/biological pathogen.

These classes of incident were applied to the components of the Project to identify scenarios, for which treatment measures were developed.

2.2.3 Project Risk Treatment Measures

IMC implements a safety management system to manage risks to health and safety in accordance with the requirements of the *Work Health and Safety (Mines and Petroleum Sites) Act 2013* and the *Work Health and Safety (Mines and Petroleum Sites) Regulation 2014*. IMC would continue to meet these obligations for the Project.

In addition, hazard control and mitigation measures are also described in the following existing management documents and systems which would be relevant to, and revised for, the Project:

- Subsidence Management Plans or Extraction Plans;
- Water Management Plan, including:
  - Site Water Balance;
  - Erosion and Sediment Control Plan;
  - Surface Water Monitoring Program; and
  - Surface and Groundwater Response Plan.
- Landscape Management Plan (to be combined into the Rehabilitation Management Plan in 2022);
- Mining Operations Plan (to be combined into the Rehabilitation Management Plan in 2022);
- Pollution Incident Response Management Plan;
- Air Quality and Greenhouse Gas Management Plan;
- Noise Management Plan;
- Traffic Management Plan;
- Bushfire Management Plan; and
- Waste Management Plan.

Key hazard controls and mitigation measures that would continue to be applied for the Project include:

- **Maintenance** – Ongoing and timely maintenance of all mobile and fixed plant equipment in accordance with the recommended maintenance schedule of the original equipment manufacturer, and consistent with maintenance schemes required by relevant legislation.
- **Staff Training** – Equipment operators and drivers would be trained and (where appropriate) licensed for their positions. Only personnel who are appropriately licensed to undertake skilled and potentially hazardous work would be permitted to do so.
- **Engineering Structures** – Mining and civil engineering structures would be constructed in accordance with the applicable AS, codes and guidelines. Where applicable, IMC would obtain the necessary licences and permits for the construction of engineering structures.
- **Contractor Management** – All contractors employed by IMC would be required to operate in accordance with the relevant AS and NSW legislation.
- **Water Management** – As reported in Appendix C of the EIS, water management structures would be constructed to generally separate runoff from disturbed areas and undisturbed areas.
- **Coal Stockpile Management** – Coal stockpiles would be monitored and managed to reduce the potential for spontaneous combustion.

- **Storage Facilities** – Storage and usage procedures for potentially hazardous materials (e.g. hydrocarbons, chemicals and explosives) would be followed. The storage and usage procedures would continue to be consistent with AS and relevant legislation. A register would be kept up-to-date with the chemicals and dangerous goods stored on-site.
- **Emergency Response** – Emergency response procedures systems and manuals would continue to be implemented.
- **Waste Management System** – Waste would continue to be managed in consideration of general waste management principles (reduce, re-use, recycle). Waste disposal measures and a waste monitoring programme are described in the Waste Management Plan.

3 RISK MANAGEMENT AND EVALUATION

Attachment A presents a qualitative assessment of the potential risks associated with the construction and operation of the Project. As described in Section 1.3, the assessment particularly evaluates the off-site risks of fixed installations at the Project to people, their property and the environment arising from abnormal and atypical hazardous events and conditions.

Hazard treatment measures have been proposed, where required, to result in a 'low' level of potential risk in accordance with the risk acceptance criteria described in Section 1.5.3. Proposed risk treatment measures are described in Section 2.2.3.

The Level 1 assessment conducted is considered justified, as this PHA demonstrates a societal risk in the negligible zone and there are no potential scenarios with significant off-site consequences in accordance with the *Multi-level Risk Assessment Guideline* (DP&I, 2011) (Section 1.4).

4 REFERENCES

Department of Planning (2011a) *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines*.

Department of Planning (2011b) *Hazardous Industry Planning Advisory Paper No. 6: Hazard Analysis*.

Department of Planning (2011c) *Hazardous Industry Planning Advisory Paper No. 4: Risk Criteria for Land Use Safety Planning.*

Department of Planning and Infrastructure (2011) *Multi-level Risk Assessment Guideline.*

National Transport Commission (2017) *Australian Code for the Transport of Dangerous Goods by Road & Rail. Edition 7.6.*

NSW Rural Fire Service (2019) *Planning for Bushfire Protection 2019*

Standards Australia and Standards New Zealand (2012) *Handbook 203:2012 Managing Environment-related Risk.*

ATTACHMENT A

HAZARD IDENTIFICATION AND ANALYSIS TABLE

Table A-1
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
On-Site Storage Hydrocarbons (i.e. fuels [diesel and petrol], Liquefied Petroleum Gas [LPG], oils, greases, degreaser and kerosene), explosives and chemicals.	Leak/Spill	Failed tank or associated fittings, pump or pipe work, or operator error leading to off-site impacts including chemical or fuel contamination.	• Design and construction of storage facilities (including bunding) and structures/tanks/pipes to relevant standards and legislation. • Storage tanks and facilities positioned to minimise potential impacts of leaks/spills. • Area around above-ground tanks sealed, preventing land contamination. • Hydrocarbon storage area and fill points drainage is directed to waste water treatment plant. • Regular inspections and maintenance (where required). • Operator training and operational procedures. • Spill management equipment (i.e. spill kits), procedures and training. • Site hazardous substance register (Chemalert) and Safety Data Sheets (SDS). • Emergency Response Systems. • Pollution Incident Response Management Plan.	1	3	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
On-Site Storage Hydrocarbons (i.e. fuels [diesel and petrol], LPG, oils, greases, degreaser and kerosene), explosives and chemicals. (Cont.)	Leak/Spill (Cont.)	Failed storage vessel due to mechanical impact or corrosion leading to off-site impacts including chemical or fuel contamination (e.g. of soil and/or waters).	• Design and construction of storage facilities (including bunding) and structures/tanks/pipes to relevant standards and legislation. • Storage tanks and facilities positioned to minimise potential impacts of leaks/spills. • Area around above-ground tanks sealed, preventing land contamination. • Hydrocarbon storage area and fill points drainage is directed to waste water treatment plant. • Regular inspections and maintenance (where required). • Protection of storage facilities from collision (e.g. bollards). • Separation of tanks from refuelling areas. • Operator training and operational procedures. • Spill management equipment (i.e. spill kits), procedures and training. • Site hazardous substance register (Chemalert) and Safety Data Sheets (SDS). • Emergency Response Systems. • Pollution Incident Response Management Plan.	1	3	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
On-Site Storage Hydrocarbons (i.e. fuels [diesel and petrol], LPG, oils, greases, degreaser and kerosene), explosives and chemicals. (Cont.)	Fire	Poor maintenance, poor design, collision, human error, or incorrect storage of chemicals leading to off-site fire- related impacts.	• Appropriate storage of fuel, gas, explosives, chemicals, and dangerous substances as required by relevant standards and legislation. • Storage tanks and facilities positioned to minimise potential impacts of leaks/spills and fire. • Protection of storage facilities from collision (e.g. bollards). • Emergency Response Systems. • Firefighting equipment and spill kits located in on-site vehicles and infrastructure where required. • Regular inspections and maintenance of firefighting equipment. • Regular maintenance of fire breaks to slow fire spread. • Liaison with Rural Fire Service for quick response. • Bushfire Management Plan.	0.3	10	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
On-Site Storage Hydrocarbons (i.e. fuels [diesel and petrol], LPG, oils, greases, degreaser and kerosene), explosives and chemicals. (Cont.)	Explosion	Explosives, fuel or gas detonates by lightning strike or human error, leading to off-site explosion/fume emissions-related impacts.	• Appropriate storage of fuel, gas, explosives, chemicals, and dangerous substances as required by relevant standards and legislation. • Design and construction of storage facilities (including bunding) and structures/tanks/pipes to relevant standards and legislation. • Separation of tanks from refuelling areas. • Emergency Response Systems. • Firefighting equipment and spill kits located in on-site vehicles and infrastructure where required. • Regular inspections and maintenance of firefighting equipment. • Operator induction, awareness of explosives and ongoing training. • Only authorised personnel with appropriate licences to handle explosives. • Bushfire Management Plan.	0.1	30	3
	Theft/vandalism	Theft or a malicious act resulting in off-site impacts.	• Installation of adequate lighting around storage facilities. • Perimeter fencing to reduce ease of access to the Dendrobium Pit Top, Cordeaux Pit Top, Kemira Valley Coal Loading Facility • Kemira Valley Coal Loading Facility, DCPP and Ventilation Shaft Site 5A. • Restriction of access to storage facilities. • CCTV camera surveillance on-site. • Restricted access to authorised personnel. • Emergency Response Systems.	1	3	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
On-Site Storage Run-of-mine (ROM) and product coal	Fire	Operator error or spontaneous combustion event leads to off-site fire-related (i.e. fume/emissions) impacts.	• Design and management of coal stockpiles (i.e. size, shape and age tracking of stockpile). • Regular monitoring and communication of stockpile status and active management. • Stockpile and belt dust suppression. • Spontaneous combustion propensity testing to inform management decisions and measures. • Regular inspections and maintenance of firefighting equipment, including a deluge system at the ROM coal loading area. • Firefighting equipment and spill kits located in on-site vehicles and infrastructure where required. • Operator training and operational procedures. • Removal of hazardous items and regular cleaning around the site.	0.3	10	3
	Equipment Malfunction	Malfunction of dust suppression equipment combined with unfavourable weather conditions resulting in significant off-site dust emissions.	• Regular inspections of stockpiles. • Regular maintenance of dust suppression equipment. • Employment of additional/supplementary dust control methods. • Air Quality and Greenhouse Gas Management Plan.	1	1	1

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
Construction/Development Activities	Spill/Leak	Spill of diesel, oils, chemicals, sewage, construction materials or untreated water, leading to impacts on surrounding watercourses.	• Fuels, oils and lubricants stored in accordance with relevant standards and legislation. • Dangerous goods register (SDS). • Construction-specific environmental controls. • Site runoff control (i.e. drains and sumps). • Operator training and operational procedures. • Spill management equipment (i.e. spill kits), procedures and training. • Emergency Response Systems. • Water Management Plan. • Waste Management Plan. • Pollution Incident Response Management Plan. • Water management of Ventilation Shaft Site 5A designed to be a zero water discharge site supported by an adequately sized sediment basin and water discharge borehole providing for dewatering when required.	1	3	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
	Fire	Poor storage of chemicals/fuel results in fire, leading to off-site bushfire.	• Fuels, oils, lubricants and chemicals stored in accordance with relevant standards and legislation. • Removal of hazardous items and regular cleaning around the site. • Firefighting equipment and spill kits located in on-site vehicles. • Regular inspections and maintenance of firefighting equipment. • Regular maintenance of fire breaks to slow fire spread. • Design of setbacks to fuel/chemical storages at Ventilation Shaft Site 5A. • Operator training and operational procedures. • Emergency Response Systems. • Liaison with Rural Fire Service for quick response. • Bushfire Management Plan.	0.3	10	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
Construction/Development Activities (Cont.)	Fire (Cont.)	Vehicle fire or electrical fire leading to off-site bushfire.	• Regular inspections and maintenance of firefighting equipment. • Regular inspections and maintenance of site infrastructure, equipment and machinery. • Firefighting equipment and spill kits located in on-site vehicles and infrastructure where required. • Regular maintenance of fire breaks to slow fire spread. • Operator training and operational procedures. • Liaison with Rural Fire Service for quick response. • Bushfire Management Plan.	0.3	10	3
	Explosion	Malicious act, operator error or lightning strike ignites stored chemicals/fuel/gas cylinders.	• Appropriate storage of fuel, gas, explosives, chemicals, and dangerous substances as required by relevant standards and legislation. • Access only for authorised personnel with appropriate licence, and display of restricted area signage. • Firefighting equipment and spill kits located in on-site vehicles. • Lightning Rods are installed at sites with substations (i.e. Kemira Valley Coal Loading Facility • , Shaft No. 1 and Shaft No. 2/3 Sites). • Operator training and operational procedures. • Emergency Response Systems. • Liaison with Rural Fire Service for quick response. • Bushfire Management Plan.	0.1	30	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
Construction/Development Activities (Cont.)	Theft	Theft of construction material or equipment, leading to an off-site event causing injury.	• Perimeter fencing to reduce ease of access to construction sites. • Restricted access to authorised personnel. • Installation of adequate lighting around construction activities. • Site security procedures (i.e. restricted access).	1	3	3
	Uncontrolled/Unauthorised Movement of Personnel	Unauthorised access to site, leading to personal injury.	• Perimeter fencing to reduce ease of access to construction sites. • Restricted access to authorised personnel. • Installation of adequate lighting around construction activities. • Site security procedures (i.e. restricted access).	1	3	3
Underground Mining Operations	Leak/Spill	Spill of oils, diesel or chemicals, leading to off-site impacts.	• Underground operations restricted to minor maintenance and services. • Operator training and operational procedures. • Fuels, oils and lubricants managed in accordance with relevant standards and legislation (particularly in regard to the operation of the ventilation shaft site). • Spill management equipment (i.e. spill kits), procedures and training. • Emergency Response Systems.	0.3	3	0.9

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
Underground Mining Operations (Cont.)	Fire	Malfunction of gas management/flaring facilities, resulting in off-site fire-related impacts.	• Use of enclosed flares. • Maintenance of sufficient fire breaks around gas flares. • Regular inspections and maintenance of site infrastructure and equipment. • Regular inspections and maintenance of firefighting equipment. • Operator training and operational procedures. • Dedicated on-site fire response equipment and team. • Emergency Response Systems. • Bushfire Management Plan.	0.3	10	3
	Release of Noxious Gases to Atmosphere	Failure of gas drainage/ventilation infrastructure or an underground fire/explosion produces emissions, causing off-site impacts.	• Adequate gas testing and design of ventilation and gas management infrastructure. • Regular inspections and maintenance of site infrastructure and equipment. • Continuous monitoring of gas levels/alarm. • Pollution Incident Response Management Plan.	0.3	3	0.9
Other Infrastructure and Supporting Systems	Leak/Spill	Leak or spill (e.g. uncontrolled release) from water management system leading to impacts on surrounding watercourses.	• Design of water management structures in accordance with relevant standards and guidelines. • Regular inspections of water containment structures and pipelines for structural integrity, effectiveness and maintenance to maintain their function. • Operator induction and ongoing training. • Water Management Plan. • Pollution Incident Response Management Plan.	1	3	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
Other Infrastructure and Supporting Systems	Leak/Spill	Unplanned off-site discharge of coal.	• Design of water management structures in accordance with relevant standards and guidelines. • Regular inspections and maintenance of site infrastructure, equipment and machinery. • Operator induction and ongoing training. • Pollution Incident Response Management Plan.	3	1	3
	Fire	Malfunction of on-site power reticulation resulting in off-site fire.	• Power reticulation designed to Australian Standards and legislation – including security measures. • Removal of hazardous items and regular cleaning around the site. • Power usage monitoring and alarms. • Firefighting equipment and spill kits located in on-site vehicles and infrastructure where required. • Regular inspections and maintenance of firefighting equipment. • Operator induction and ongoing training. • Dedicated on-site fire response equipment and team. • Liaison with Rural Fire Service for quick response. • Bushfire Management Plan.	0.3	10	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
Other Infrastructure and Supporting Systems (Cont.)	Fire (Cont.)	Spontaneous combustion and/or fire or explosion at Kemira Valley Coal Loading Facility, leading to off-site fire-related impacts.	• Appropriate storage and transportation of fuel, gas, explosives, chemicals, coal and dangerous substances to relevant standards and legislation. • Removal of hazardous items and regular cleaning around the site. • Stockpile dust suppression. • Spontaneous combustion propensity testing to inform management decisions and measures. • Regular inspections and maintenance of firefighting equipment, including a deluge system at the ROM coal loading area. • Firefighting equipment and spill kits located in on-site vehicles. • Operator induction, ongoing training and operational procedures. • Dedicated on-site fire response equipment and team. • Liaison with Rural Fire Service for quick response. • Air Quality and Greenhouse Gas Management Plan. • Bushfire Management Plan.	0.3	10	3

Table A-1 (Continued)
Hazard Identification and Analysis

Project Component	Incident Type	Scenario	Existing and Proposed Treatment Measures	Likelihood[1]	Consequence[2]	Risk[3]
Other Infrastructure and Supporting Systems (Cont.)	Fire (Cont.)	Spontaneous combustion and/or fire or explosion at Dendrobium Coal Preparation Plant leading to off-site fire-related impacts.	• Appropriate storage and transportation of fuel, gas, explosives, chemicals, coal and dangerous substances to relevant standards and legislation. • Removal of hazardous items and regular cleaning around the site. • Stockpile dust suppression. • Spontaneous combustion propensity testing to inform management decisions and measures. • Regular inspections and maintenance of firefighting equipment. • Firefighting equipment and spill kits located in on-site vehicles. • Operator induction, ongoing training and operational procedures. • Dedicated on-site fire response equipment and team. • Liaison with Rural Fire Service for quick response. • Air Quality and Greenhouse Gas Management Plan. • Bushfire Management Plan.	0.3	10	3

[1]Refer to Table 1. [2]Refer to Table 2. [3]Refer to Table 3.