Peabody ENERGY

APPENDIX P

ENVIRONMENTAL RISK ASSESSMENT

Peabody Energy – Wilpinjong Coal Pty Ltd

Wilpinjong Extension Project
ENVIRONMENTAL RISK ASSESSMENT

Report Title:	Wilpinjong Extension Project Environmental Risk Assessment
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Job:	J4281
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Title	Wilpinjong Extension Project – Environmental Risk Assessment
General Description	This report summarises the results and recommended follow up actions from the Environmental Risk Assessment conducted for the Wilpinjong Extension Project
Key Supporting Documentation	AS/NZS ISO 31000:2009 *Risk Management – Principles and Guidelines* MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* HB 203:2012 *Managing Environment-related Risk*

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No	User
1	Resource Strategies, Peabody Energy
2	ERA review team
3	Resource Strategies, Peabody Energy

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1 INTRODUCTION

The Wilpinjong Coal Mine is an existing open-cut coal mining operation situated approximately 40 kilometres (km) north-east of Mudgee, near the village of Wollar, within the Mid-Western Regional Council Local Government Area, in central New South Wales (NSW) (Figure 1).

The Wilpinjong Extension Project (the Project) is a proposed extension of open cut operations at the Wilpinjong Coal Mine for an additional operational life of approximately seven years.

Wilpinjong Coal Pty Ltd (WCPL) is seeking approval from the NSW Minister for Planning for a Development Consent under Division 4.1 of Part 4 of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) for the Project.

This document is an Environmental Risk Assessment (ERA) for the Project.

1.1 *Aim and Objectives*

The primary aim and objectives of the study were to:

1. identify the key potential environmental issues associated with the Project with a cross section of subject matter experts, decision makers and key stakeholders;
2. consider the requirements for any contingencies for the different issue types; and
3. assess the level of risk for a selection of potential loss scenarios associated with the key potential environmental issues.

The ERA team identified the following items as desired outcomes from the process:

1. identification of key potential environmental issues to be addressed in the Environmental Impact Statement (EIS); and
2. a document suitable for inclusion in the EIS and prepared in accordance with Australian Standard/New Zealand Standard (AS/NZS) International Organisation for Standardisation (ISO) 31000:2009 *Risk Management – Principles and Guidelines* (AS/NZS ISO 31000:2009).

1.2 *Client*

The client for the analysis is WCPL, a wholly owned subsidiary of Peabody Energy Australia Pty Limited (Peabody Energy).

1.3 *Scope*

The scope for the ERA workshop was:

> *To conduct a risk assessment of the potential environmental impacts of the development, identifying the key issues for further assessment.*

1.4 *Key Assumptions*

The identification of key assumptions is a critical part of the risk assessment process; they form the basis for many engineering/Project decisions and it is important that these are validated and reviewed as part of the risk management process.

The team noted that safety and business-related issues (i.e. non-environmental risks) identified were intended to be addressed by other Wilpinjong Coal Mine risk management systems and were not explored in any depth in the ERA.

LEGEND

- Mining Lease Boundary
- Exploration Licence Boundary
- Authorisation Boundary
- Local Government Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area
- Mining Operation

Source: NSW Land & Property Information (2015); NSW Dept of Industry (2015); Geoscience Australia (2011)

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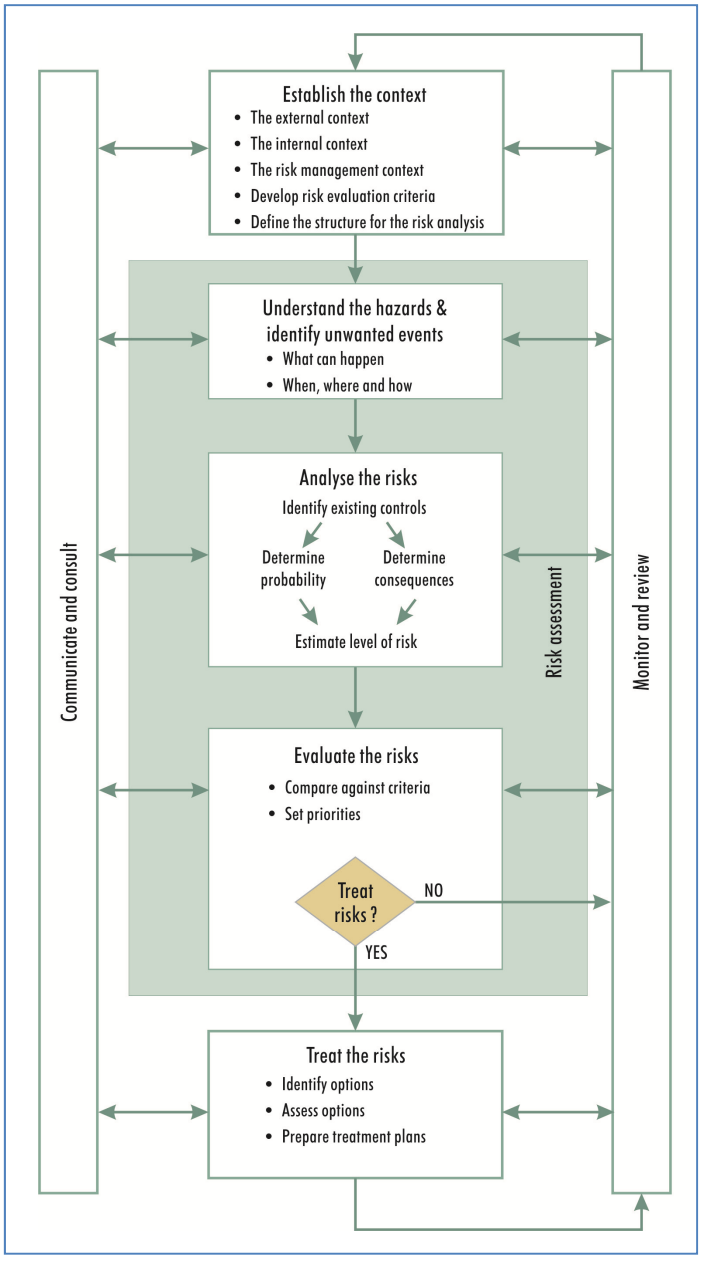
WILPINJONG EXTENSION PROJECT

Project Location

Figure 1

1.5 *Risk Assessment Process*

The risk assessment process was based on the framework provided on Figure 2 (based on AS/NZS ISO 31000:2009, MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* [NSW Department of Trade and Investment, 2011] and AS HB 203:2012 *Managing Environment-related Risk* [AS HB 203:2012]).



Source: AS/NZS ISO 31000:2009.

Figure 2 – Risk Management Process

1.6 *Resourcing, Schedule and Accountabilities*

The following resources were allocated in order to effectively conduct the ERA:

1. A team of personnel with suitable experience and knowledge of coal mining operations and environmental issues in the area associated with the Project.
2. External facilitators for the risk assessment and write-up of results.
3. Aerial photographs, Project layout drawings and other supporting information.

The outcomes of the ERA and associated accountabilities will be integrated into the EIS and overall WCPL management systems so that they are effectively reviewed, implemented and monitored.

1.7 *Methodology*

1.7.1 Framework

Figure 2 outlines the overall framework utilised for the ERA.

1.7.2 Key Steps

The key steps in the process included:

1. confirming the scope of the ERA;
2. listing the key assumptions on which the ERA is based;
3. reviewing available data on the Project including reports, plans, maps and aerial photos (both prior to and during the workshop);
4. conducting a team-based risk assessment that:
    a) provides detailed descriptions of the tasks to be undertaken and the proposed method;
    b) identifies hazards and assesses the level of risk; and
    c) develops a list of recommended controls to treat the risk (through prevention, monitoring, management and rehabilitation strategies);
5. preparing a draft report in accordance with AS/NZS ISO 31000:2009, MDG1010 – *Minerals Industry Safety and Health Risk Management Guideline* (NSW Department of Trade and Investment, 2011), and AS HB 203:2012 for review by Project personnel and other ERA team members;
6. Incorporating comments from Project personnel and the ERA team;
7. Conducting a broader team review of the draft report by Project EIS specialists; and
8. Finalising the report and issue as a controlled copy for ongoing use.

With respect to the overall framework (Figure 2), Steps 1 to 3 above represent the 'establish the context' phase and Steps 4 and 5 represents the 'identify the risks', 'analyse the risks', 'evaluate the risks' and 'treat the risks' phases.

The outcomes of the ERA and associated accountabilities will be integrated into the EIS and overall Project management systems so that they are effectively reviewed, implemented and monitored (Section 5).

1.7.3 External Facilitation

The team was facilitated through the process by ***SP Solutions*** – a company specialising in risk assessment and risk management processes.

2 ESTABLISH THE CONTEXT

2.1 *Project Summary*

The Project would include the following activities (Figure 3):

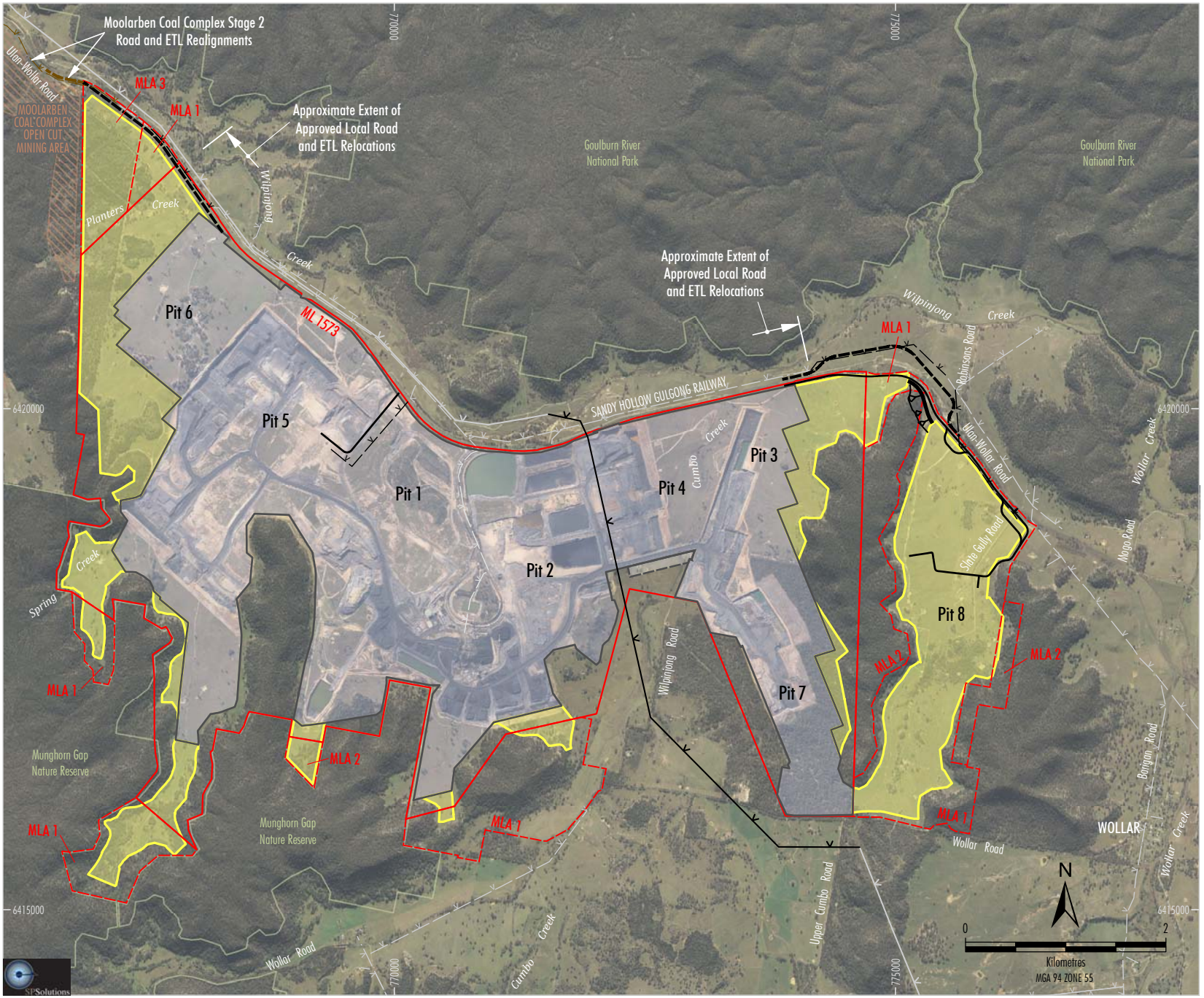
- open cut mining of run-of-mine (ROM) coal from the Ulan Coal Seam and Moolarben Coal Member in Mining Lease (ML) 1573 and in new Mining Lease Application areas in Exploration Licence (EL) 6169 and EL 7091;
- approximately 800 hectares (ha) of open cut extensions, including:
  - approximately 500 ha of incremental extensions to the existing open cut pits in areas of ML 1573 and EL 6169; and
  - development of a new open cut pit of approximately 300 ha in EL 7091 (Pit 8);
- continued production of up to 16 million tonnes per annum (Mtpa) of ROM coal;
- continued use of the Wilpinjong Coal Mine Coal Handling and Preparation Plant (CHPP) and general coal handling and rail loading facilities and other existing and approved supporting mine infrastructure;
- rail transport of approximately 13 Mtpa of thermal product coal to domestic and export customers (within existing maximum and annual average daily rail limits);
- relocation of a section of the TransGrid Wollar to Wellington 330 kilovolt (kV) electricity transmission line (ETL) to facilitate mining in Pit 8;
- various local infrastructure relocations to facilitate the mining extensions (e.g. realignment of Ulan-Wollar Road and associated rail level crossing, relocation of local ETLs and services);
- construction and operation of additional mine access roads from Ulan-Wollar Road to service new mining facilities located in Pits 5 and 8;
- construction and operation of new ancillary infrastructure in support of mining, including: mine infrastructure areas, ROM pads, haul roads, electricity supply, communications installations, light vehicle roads, access tracks, remote crib huts, up-catchment diversions, dams, pipelines and other water management structures;
- extension of the approved mine life by approximately seven years (i.e. from approximately 2026 to 2033);
- a peak operational workforce of approximately 625 people;
- ongoing exploration activities; and
- other associated minor infrastructure, plant and activities.

2.2 *Risk Management Context*

The ERA was conducted cognisant of the following documents:

- AS/NZS ISO 31000:2009;
- AS HB 203:2012; and
- MDG1010 – *Minerals Industry Safety and Health Risk Management Guideline* (NSW Department of Trade and Investment, 2011).

A Preliminary Environmental Assessment was undertaken for the Project in 2014. The key potential environmental impacts identified in the Preliminary Environmental Assessment were also considered in this ERA.



LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Approved/Existing Open Cut and Contained Infrastructure Area
- Relocated Block Bank and Cumbo Creek Disturbance Area
- Proposed Open Cut Extension Area
- Proposed Public Road Realignment
- Proposed Pit 3/8 Haul Road
- Proposed Service Road
- Proposed Local ETL Realignment/Relocation
- Proposed Relocated TransGrid 330 kV ETL
- Existing Local ETL
- Existing TransGrid 330 kV ETL

Source: WCPL (2015); NSW Dept of Industry (2015)
Orthophoto: WCPL (Jun 2015; Jun 2014)

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WILPINJONG EXTENSION PROJECT

Project General Arrangement

Figure 3

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2.3 *Risk Criteria*

The risk criteria utilised is to reduce the risk to *As Low As Reasonably Practicable* (ALARP) or lower. Figure 4 schematically shows the three risk management zones *viz*. intolerable, ALARP and tolerable (or broadly acceptable). The middle zone is referred to as the ALARP zone.

Flying is an example of a risk considered by most people to be a tolerable risk; whilst smoking is generally considered to be an activity which cannot be justified on any grounds from a risk perspective. Intolerable items such as smoking are at the top of the pyramid whereas much lower risks, such as flying in an aeroplane, sit at the lower end of the ALARP zone (close to tolerable [or broadly acceptable]).

The risk ranking matrices used during the ERA workshop are presented in Section 4.

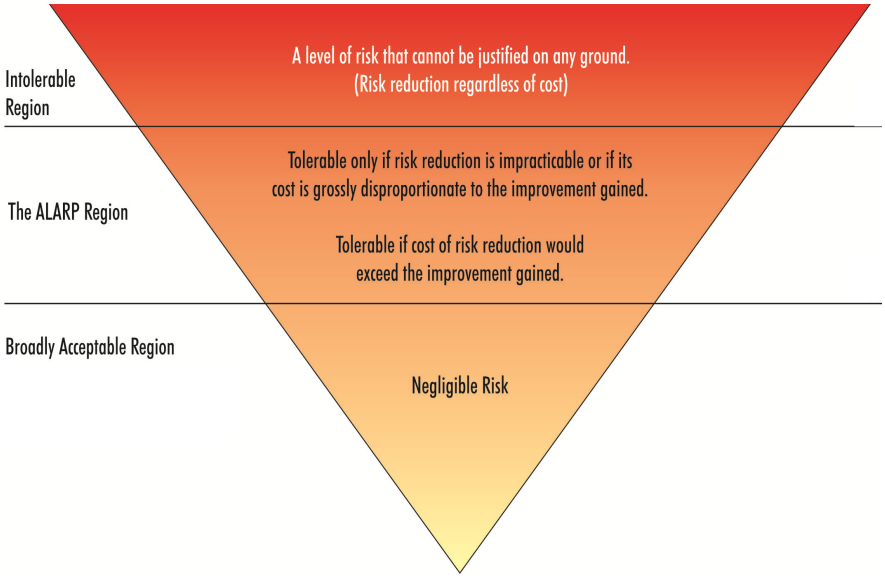

Figure 4: Risk Criteria "ALARP"

3 IDENTIFYING RISKS

3.1 *Risk Assessment Tools*

The identification of risks involved the use of risk assessment "tools" appropriate for identifying potential loss scenarios associated with the Project. The tools used were:

- Introduction – before the potential issues were brainstormed it was important that the whole team had a good understanding of the Project, and this was confirmed by the facilitator.
- Brainstorming – this was used to draw out the main issues using the understanding, relevant experience and knowledge of the team. This session also used prompt words to build on the experience base of the team and identify any potential environmental issues and potential loss scenarios.
- Modified Hazard and Operability Study (HAZOP) analysis – this involved the review of key words and aerial photographs, and the consequent identification of potential environmental issues at each location during each phase of operation.

3.2 *Environmental Risk Assessment Team*

The team met on the 17 January 2013 in Sydney. A team-based approach was used in order to have an appropriate mix of skills and experience to identify the potential loss scenarios/issues. Details of the team members and their relevant qualifications and experience are included in Table 1.

Table 1 – ERA Team Members

Name	Role	Relevant Qualifications and Experience
Peter Standish	Facilitator, SP Solutions	PhD, BE (Hon), Dip Bus Mgt, Risk Analysis Trained. Certificate of Competence as a Manager. Thirty-five years experience in underground and open cut mining operations with operating, managerial and contract management experience. Involved in environmental risk review for nine years. Conducting Risk Analyses for 14 years.
Peter Tonkin	Project Manager, Peabody Energy	Member Institute of Engineers Australia, over 30 years as Project Manager and Company Director.
Brian Neilsen	Director, Strategic Open Cut Mine Planning	B Eng (Mining), 18 years industrial experience (coal and international).
Jamie Lees	Director Sustainable Development, Peabody Energy	BAppSc (Ag major), over 15 years natural resource and environmental management experience.
Kieren Bennetts	Environment & Community Manager, WCPL	BSc (Resource & Environmental Management), over 14 years industrial experience in environmental works.
Nick Collings	Technical Services Manager, WCPL	BSc (Surveying), 25 years mining experience (open cut).
Noel Merrick	Director, HydroSimulations	PhD, MSc, GDip (DP), BSc, Groundwater modeller, hydrogeologist and geophysicist. Over 40 years experience.
Tony Marszalek	Principal Water Resources Engineer, Gilbert & Associates	B Eng (Civil), M Eng Sc, over 25 years experience as a consulting hydrologist.
Joshua Hunt	Principal, Resource Strategies	B Eng (Civil), 18 years experience in large-scale civil and mining projects.
Stirling Bartlam	Senior Environmental Manager, Resource Strategies	BSc (Geographical Sciences), over 14 years experience in environmental management and project approvals in resource industry.
Josh Peters	Senior Environmental Manager, Resource Strategies	B EnvSc, over 10 years experience in environmental management and project approvals in resource industry.

Subsequent to the workshop, a broader team review of the draft ERA report was undertaken including additional EIS specialists, including:

- WRM Water & Environment Pty Ltd (surface water).
- Todoroski Air Sciences Pty Ltd (air quality).
- SLR Consulting Australia Pty Ltd (noise and blasting).
- Hunter Eco (biodiversity).

3.3 *Risk Identification*

3.3.1 Brainstorming

Brainstorming (or brain writing) is a process involving individual effort to nominate ideas/issues which are then refined through general discussion and key word association to capture issues and concerns of the involved personnel. It is enhanced through the use of key word association processes based on work by Edward de Bono, and is intended to generate a wide range of data on losses, controls and general issues related to the Project area.

No 'filtering' of the data is allowed during the process, and the reader should be conscious of the intent of not missing a potential 'left field' issue when reading through the material.

Issues identified during the brainstorming session are presented in Attachment A.

3.3.2 Modified HAZOP

The next 'tool' applied with the team was a modified HAZOP. In this process the Project general arrangement (e.g. Figure 3) was referred to along with a consideration of the phases of operation and the potential impacts that could arise. The nodes identified that were considered by the team were:

- Mine infrastructure area.
- Haul roads.
- Drainage lines.
- Open Cut – active areas.
- Open Cut – waste emplacement.
- Open Cut – rehabilitated areas.
- Offsets (Enhancement and Conservation Areas [ECAs]).
- Powerlines.
- Water structures.
- Tailings storage.
- Other mines/projects in the region.

The output from this process was added to the issues/risk register from the team session in Attachment A.

The generic key words used in the modified HAZOP process representing environmental issue subject areas were:

- Surface Water;
- Groundwater;
- Noise and Blasting;
- Air Quality;
- Flora;
- Fauna (Terrestrial and Aquatic);
- Road Transport;
- Agricultural Resources;
- Visual;
- Aboriginal Cultural Heritage;
- Historical Heritage;
- Social Impact;

- Economic Impact;
- Geochemistry; and
- Land Contamination.

3.3.3 Identification of Key Environmental Issue Types

The key potential environmental issues were identified through a "voting" system whereby team members were assigned a number of "votes" to allocate to what they considered to be the key issues. Key potential issues are provided in Table 2.

Table 2 – Key Potential Environmental Issues

Ref	Description of Issue
IS001	Noise and Blasting – potential effects of operational noise and blasting emissions on surrounding landowners and private lands (project specific and cumulative).
IS002	Air Quality – potential effects of dust emissions on surrounding landowners and private lands (project specific and cumulative).
IS004	Blasting – incremental potential effects of blasting on cultural (i.e. shelters, overhangs) and historic heritage sites.
IS006	Air Quality – potential for spontaneous combustion events in stockpiles and elevated in-pit waste rock emplacements.
IS013	Air Quality – cumulative impacts (e.g. Ulan Mine Complex, Moolarben Coal Complex, Bowdens Silver Project, Bylong Coal Project and Cobbora Coal Project) on air quality.
IS015	Groundwater – potential incremental impacts on aquifers and groundwater users.
IS021	Surface Water – failure or reduced effectiveness of upslope diversions and/or water treatment facilities rendering site water balance calculations incorrect or causing unlicensed off-site impact.
IS026	Groundwater – incremental induced leakage from creeks due to groundwater depressurisation effects.
IS027	Groundwater – incremental reduced base flow to creeks due to groundwater depressurisation effects.
IS028	Groundwater – potential incremental direct and indirect impacts on springs.
IS029	Groundwater – removal of Slate Gully and Wilpinjong Creek alluvium.
IS033	Surface Water – stability of creek diversions (short and long term).
IS038	Surface Water – reverse osmosis plant concentrate management.
IS042	Surface Water – seepage/runoff from incremental mine disturbance areas bypassing water management system and migrating off-site with subsequent downstream impacts.
IS045	Flora and Fauna – incremental and cumulative loss of vegetation and fauna habitat and potential impact on listed threatened species.
IS054	Rehabilitation/Closure – incremental changes to final voids and associated post-mining water management system.
IS064	Road Transport – increased traffic on the public road network.
IS069	Social – cumulative incremental impacts with other mining projects on community infrastructure (roads, accommodation, services).
IS070	Aboriginal Heritage – potential incremental direct impacts on Aboriginal heritage items or areas of significance.
IS165	Blasting – potential impacts of blasting on the Wollar Cemetery, St Laurence O'Toole Catholic Church or St Luke's Anglican Church.
IS167	Groundwater – potential groundwater depressurisation effects on National Park and Nature Reserve.
IS178	Flora and Fauna – realigned TransGrid Wollar to Wellington 330 kV ETL impacts on ECAs (offset areas).

The key environmental issues identified in the ERA are addressed in the EIS through inclusion of the following specific environmental studies:

- Appendix A – Noise and Blasting Assessment;
- Appendix B – Air Quality and Greenhouse Gas Assessment;
- Appendix C – Groundwater Assessment;
- Appendix D – Surface Water Assessment;
- Appendix E – Biodiversity Assessment Report and Biodiversity Offset Strategy;
- Appendix F – Aquatic Ecology Assessment;
- Appendix G – Aboriginal Cultural Heritage Assessment;
- Appendix H – Historical Heritage Assessment;
- Appendix I – Land and Soil Assessment;
- Appendix J – Road Transport Assessment;
- Appendix K – Geochemistry Assessment;
- Appendix L – Land Contamination Assessment;
- Appendix M – Economic Impact Assessment;
- Appendix N – Social Impact Assessment;
- Appendix O – Visual Assessment; and
- Appendix Q – Preliminary Hazard Analysis.

3.3.4 Referred Issues

Referred issues are issues raised during the ERA workshop that were:

- outside the scope of the ERA;
- outside of the Project scope; and/or
- beyond the control of Peabody.

These “referred issues” were considered to warrant consideration by WCPL (Table 3).

Table 3 – Summary of Referred Issues

Ref	Environmental Issue Subject Area	Description of Issue
IS093	Approvals/Operational	Ongoing Exploration Programmes.
IS086	Approvals/Operational	Compliance with Dust Pollution Reduction Program requirements.

4 ANALYSE RISKS

4.1 *Probability and Maximum Reasonable Consequence*

Potential loss scenarios (primarily based on the identified key potential environmental issues) were ranked for risk by the ERA team. A tabular analysis was used for this risk ranking process, based on the probability and consequence of a loss scenario occurring as determined by the ERA team.

The following definition of risk was used:

- the combination of the probability of an unwanted event occurring; and
- the Maximum Reasonable Consequences (MRCs) should the event occur.

Tables 4 to 6, inclusive, present the ERA matrix tools that were used for ranking risks.

Table 4 – Qualitative Measures of Probability

PROBABILITY (P)		
A	Almost Certain	Happens often
B	Likely	Could easily happen
C	Possible	Could happen and has occurred elsewhere
D	Unlikely	Hasn't happened yet but could
E	Rare	Conceivable, but only in extreme circumstances

Table 5 – Qualitative Measures of Maximum Reasonable Consequence

CONSEQUENCE – ENVIRONMENT (C)		
1	Extreme environmental harm	e.g. widespread catastrophic impact on environmental values of an area
2	Major environmental harm	e.g. widespread substantial impact on environmental values of an area
3	Serious environmental harm	e.g. widespread and considerable impact on environmental values of an area
4	Material environmental harm	e.g. localised and considerable impact on environmental values of an area
5	Minimal environmental harm	e.g. minor impact on environmental values of an area

Table 6 – Risk Ranking Table

		PROBABILITY (P)				
		A	B	C	D	E
CONSEQUENCE (C)	1	1 (H)	2 (H)	4 (H)	7 (M)	11 (M)
	2	3 (H)	5 (H)	8 (M)	12 (M)	16 (L)
	3	6 (H)	9 (M)	13 (M)	17 (L)	20 (L)
	4	10 (M)	14 (M)	18 (L)	21 (L)	23 (L)
	5	15 (M)	19 (L)	22 (L)	24 (L)	25 (L)

	Intolerable
	ALARP – As low as reasonably practicable
	Tolerable

4.2 *Risk Ranking*

Using the ERA matrix tools (Tables 4 to 6), risk ranking was undertaken by the team on loss scenarios based on a representative selection of the key potential environmental issues (Table 7).

Table 7 – Risk Ranking Results

Ref	Description of Issue	Ranking Basis		P	C	R
		Loss Scenario	Mitigation			
IS001	Noise and Blasting - potential effects of operational noise and blasting emissions on surrounding landowners and private lands (project specific and cumulative).	Exceedance of criteria, actual impacts are greater than modelled impacts on surrounding landowners and private lands.	Mitigated by predictive modelling using calibrated model, real time monitoring, triggers and operational shutdowns (as described in the Noise Management Plan), noise and blast monitoring (including investigation of elevated records), property acquisitions and landholder agreements. Fixed and mobile plant operated and maintained to original equipment manufacturer standards. Blast design and predictive site-law development undertaken by suitably qualified and experienced personnel.	C	4	**18 (L)**
IS002	Air Quality - potential effects of dust emissions on surrounding landowners and private lands (project specific and cumulative).	Exceedance of criteria, actual impacts are greater than modelled impacts on private landowners and private lands.	Mitigated by predictive modelling by suitably qualified expert, real time monitoring, triggers and operational modifications during adverse conditions, onsite control measures (water carts and sprays), property acquisitions, landholder agreements and progressive rehabilitation. WCPL-owned dwellings would be vacated where exceedances are measured or predicted.	C	4	**18 (L)**
IS004	Blasting - incremental potential effects of blasting on cultural (i.e. shelters, overhangs) and historic heritage sites.	Material damage to cultural or historic heritage site/feature.	Mitigated by blast monitoring, routine inspections including photographic recording of site features and alterations to blasting parameters where necessary. Blast design and predictive site-law development undertaken by suitably qualified and experienced personnel.	C	4	**18 (L)**

Table 7 – Risk Ranking Results (Continued)

Ref	Description of Issue	Ranking Basis		P	C	R
		Loss Scenario	Mitigation			
IS006	Air Quality - potential for spontaneous combustion events in stockpiles and elevated in-pit waste rock emplacements.	Significant and sustained spontaneous combustion event resulting in off-site odours.	Mitigated by stockpile management to reduce available oxygen, prioritised washing of 'hot' coal, compaction and monitoring of weather conditions before applying mitigation. Long term waste rock emplacement areas containing carbonaceous material to be constructed and managed to minimise the potential for self-heating. Mitigation measures described in Spontaneous Combustion Management Plan.	B	4	**14 (M)**
IS015	Groundwater - potential incremental impacts on aquifers and groundwater users.	Exceedance of Aquifer Interference Policy threshold criteria, actual impacts are greater than modelled impacts on private bores and private lands.	Mitigated by WCPL owning many of the local registered bores, and by WCPL committing to 'make good', compensatory water supply, in the event that the Project is shown to be the cause of excessive drawdown at a private bore.	C	5	**22 (L)**
IS021	Surface Water - failure or reduced effectiveness of upslope diversions and/or water treatment facilities rendering site water balance calculations incorrect or causing unlicensed off-site impact.	Increased load on water management system resulting in uncontrolled release of mine water off-site.	Mitigated by appropriate design, construction and maintenance of water management system (in accordance with the Surface Water Management and Monitoring Plan), treatment and controlled release of treated water and regular updates of the site water balance model.	C	4	**18 (L)**
IS026	Groundwater - incremental induced leakage from creeks due to groundwater depressurisation effects.	Significant additional loss of base flow in creeks.	Mitigated by licensing of impacts and groundwater monitoring in the Wilpinjong Creek alluvium and creek flow monitoring. Potential water licence transfers to offset loss.	C	4	**18 (L)**

Table 7 – Risk Ranking Results (Continued)

Ref	Description of Issue	Ranking Basis		P	C	R
		Loss Scenario	Mitigation			
IS027	Groundwater - incremental reduced base flow to creeks due to groundwater depressurisation effects.	Significant additional loss of base flow in creeks.	Mitigated by licensing of impacts and groundwater monitoring in the Wilpinjong Creek alluvium and creek flow monitoring triggers. Potential water licence transfers to offset loss.	C	4	**18 (L)**
IS028	Groundwater - potential incremental direct and indirect impacts on springs.	Groundwater Dependent Ecosystem (GDE) and/or flow in Wilpinjong Creek affected.	Mitigated by detailed groundwater modelling undertaken for the EIS and ongoing groundwater monitoring in conjunction with developed trigger levels as part of the Water Management System.	B	5	**19 (L)**
IS042	Surface Water - seepage/runoff from incremental mine disturbance areas bypassing water management system and migrating off-site with subsequent downstream impacts.	Contaminated water from site moving into the surrounding environment.	Mitigated by appropriate design, construction and maintenance of water management system as outlined in the Surface Water Management and Monitoring Plan and site Ground Disturbance Permit.	C	4	**18 (L)**
IS045	Flora and Fauna - incremental and cumulative loss of vegetation and fauna habitat and potential impact on listed threatened species.	Cumulative impacts on Endangered Ecological Communities and fauna habitat.	Mitigated by the application of the NSW Biodiversity Offset Policy - leading to a low net impact at a regional scale. Detailed design of surface infrastructure to avoid impacts where practical. Development and implementation of a comprehensive Biodiversity Management Plan including pre-clearance surveys (vegetation clearance) protocols and demarcation of clearance boundaries as part of site Ground Disturbance Permit.	A	5	**15 (M)**

Table 7 – Risk Ranking Results (Continued)

Ref	Description of Issue	Ranking Basis		P	C	R
		Loss Scenario	Mitigation			
IS054	Rehabilitation/Closure - incremental changes to final voids and associated post-mining water management system.	Decline in downstream water quality.	Mitigated through general consistency with the existing/approved final void concepts and development of a final void water balance to inform the appropriate design of the final landform to reduce the potential for release of contaminated water.	D	4	**21 (L)**
IS064	Road Transport - increased traffic on the public road network.	Significant reduction in level of service or significant increased road safety risk.	Mitigated through ongoing traffic management (car pooling and management of shift times), contributions to council (through a Voluntary Planning Agreement [VPA]), contributions to upgrades to Ulan Road through the Ulan Road Strategy and analysis of potential cumulative impacts. Shared reporting of unsafe driver behaviour between Ulan Mine Complex, Moolarben Coal Complex and Wilpinjong Coal Mine.	D	4	**21 (L)**
IS069	Social - cumulative incremental impacts with other mining projects on community infrastructure (e.g. roads, accommodation, services).	Adverse impacts on social services, accommodation etc. that is not covered by a VPA.	Mitigated through ongoing stakeholder engagement, hiring locally where possible, philanthropic donations, analysis of cumulative impacts and consultation between Ulan Mine Complex, Moolarben Coal Complex and Wilpinjong Coal Mine.	D	5	**24 (L)**

Table 7 – Risk Ranking Results (Continued)

Ref	Description of Issue	Ranking Basis		P	C	R
		Loss Scenario	Mitigation			
IS070	Aboriginal Heritage - potential incremental direct impacts on Aboriginal heritage items or areas of significance.	Direct impact on Aboriginal heritage items or areas of significance due to surface disturbance activities.	Mitigated by workforce education through the site induction process, heritage surveys informing management of heritage items, ongoing consultation with the Aboriginal community, salvage programmes (in accordance with the Aboriginal Cultural Heritage Management Plan) and pre-clearance protocols as part of the site Ground Disturbance Permit.	A	5	**15 (M)**

Notes:

P = Probability

C = Consequence

R = Risk

5 MONITOR AND REVIEW

5.1 *Nominated Coordinator*

The nominated client review facilitator is Jamie Lees, Director Sustainable Development, Peabody Energy.

It is understood the nominee will co-ordinate the inclusion of the key potential environmental issues into the various studies undertaken as part of the EIS and the overall WCPL management systems.

5.2 *Communication and Consultation*

Communication and consultation form an integral part of the risk management process.

Consultation, involvement of personnel (Project personnel and specialists) and communication of the process and outcomes of the ERA are intended to be achieved by the inclusion of this report and the relevant specialist assessments addressing the key potential environmental issues in the EIS.

5.3 *Concluding Remarks*

The risk assessment process conducted by the team was aligned with AS/NZS ISO 31000:2009 and MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* (Department of Trade and Investment, 2011), with the intention of identifying the key potential environmental issues for the Project.

An appropriately detailed assessment of the key potential environmental issues will be included in the EIS appendices/sections as presented in Table 8.

Table 8 – Key Potential Environmental Issues to be Further Assessed in the EIS

Ref	Description of Issue	EIS Appendix/Section
IS001	Noise and Blasting – potential effects of operational noise and blasting emissions on surrounding landowners and private lands (project specific and cumulative).	Section 4 and Appendix A
IS002	Air Quality – potential effects of dust emissions on surrounding landowners and private lands (project specific and cumulative).	Section 4 and Appendix B
IS004	Blasting – incremental potential effects of blasting on cultural (i.e. shelters, overhangs) and historic heritage sites.	Section 4 and Appendix A
IS006	Air Quality – potential for spontaneous combustion events in stockpiles and elevated in-pit waste rock emplacements.	Section 4 and Appendix B
IS013	Air Quality – cumulative impacts (e.g. Ulan Mine Complex, Moolarben Coal Complex, Bowden Silver Project, Bylong Coal Project and Cobbora Coal Project) on air quality.	Section 4 and Appendix B
IS015	Groundwater – potential incremental impacts on aquifers and groundwater users.	Section 4 and Appendix C
IS021	Surface Water – failure or reduced effectiveness of upslope diversions and/or water treatment facilities rendering site water balance calculations incorrect or causing unlicensed off-site impact.	Section 4 and Appendix D
IS026	Groundwater – incremental induced leakage from creeks due to groundwater depressurisation effects.	Section 4 and Appendix C
IS027	Groundwater – incremental reduced base flow to creeks due to groundwater depressurisation effects.	Section 4 and Appendix C
IS028	Groundwater – potential incremental direct and indirect impacts on springs.	Section 4 and Appendix C
IS029	Groundwater – removal of Slate Gully and Wilpinjong Creek alluvium.	Section 4 and Appendix C

Table 8 – Key Potential Environmental Issues to be Further Assessed in the EIS (Continued)

Ref	Description of Issue	EIS Appendix/Section
IS033	Surface Water – stability of creek diversions (short and long term).	Section 4 and Appendix D
IS038	Surface Water – reverse osmosis plant concentrate management.	Section 4 and Appendix D
IS042	Surface Water – seepage/runoff from incremental mine disturbance areas bypassing water management system and migrating off-site with subsequent downstream impacts.	Section 4 and Appendix D
IS045	Flora and Fauna – incremental and cumulative loss of vegetation and fauna habitat and potential impact on listed threatened species.	Section 4 and Appendix E
IS054	Rehabilitation/Closure – incremental changes to final voids and associated post-mining water management system.	Section 5 and Appendix D
IS064	Road Transport – increased traffic on the public road network.	Section 4 and Appendix J
IS069	Social – cumulative incremental impacts with other mining projects on community infrastructure (roads, accommodation, services).	Section 4 and Appendix N
IS070	Aboriginal Heritage – potential incremental direct impacts on Aboriginal heritage items or areas of significance.	Section 4 and Appendix G
IS165	Blasting – potential impacts of blasting on the Wollar Cemetery, St Laurence O'Toole Catholic Church or St Luke's Anglican Church.	Section 4 and Appendix A
IS167	Groundwater – Potential groundwater depressurisation effects on National Park and Nature Reserve.	Section 4 and Appendix C
IS178	Flora and Fauna – realigned TransGrid Wollar to Wellington 330kV ETL impacts on ECAs (offset areas).	Section 4 and Appendix E

The risk rankings indicate that the loss scenarios ranked were within the "Medium - ALARP" or the "Low" range, hence the relevant risk criteria (Section 2.3) are considered to have been met.

SP Solutions would like to thank all personnel who contributed to the risk assessment including the team members who collated information and prepared documentation.

6 REFERENCES

Department of Trade and Investment (2011) *MDG1010 Minerals Industry Safety and Health Risk Management Guideline.*

Attachment A – Output of Analysis Tools

The outputs from the team's analyses are presented below. This list has been sorted according to the environmental issue subject area.

Risk Register/Issues Output

Ref	Environmental Issue Subject Area	Description of Issue
IS167	Groundwater	Potential groundwater drawdown effects on National Park and Nature Reserve.
IS166		Impact on groundwater quality from flooding events and seepage from pits and dams.
IS159		Changing groundwater conditions in cultural sites.
IS158		Potential impacts on ground water dependent communities (perched).
IS040		Mobilisation of poorer quality groundwater to void for subsequent treatment and use.
IS039		Reduced access to groundwater by groundwater users' bores due to aquifer depressurisation.
IS029		Removal of portions of Slate Gully and Wilpinjong Creek alluvium.
IS028		Potential incremental direct and indirect impacts on springs.
IS027		Incremental reduced baseflow to creeks due to groundwater depressurisation effects.
IS026		Incremental induced leakage from creeks due to groundwater depressurisation effects.
IS015		Potential incremental impacts on aquifers and groundwater users.
IS043	Surface Water	Water reports to pits from Wilpinjong Creek during flood event.
IS042		Seepage/runoff from incremental mine disturbance areas bypassing water management system and migrating off-site with subsequent downstream impacts.
IS038		Reverse osmosis plant concentrate management.
IS036		Acid Mine Drainage.
IS033		Stability of creek diversions (short and long term).
IS031		Seepage from final landform to final voids increasing inflow to final voids and reducing flow to receiving waters.
IS025		Reduction in creek flows downstream of mine due to catchment excision during and post mining.
IS023		Water supply shortfall in dry times.
IS021		Failure or reduced effectiveness of upslope diversions and/or water treatment facilities rendering site water balance calculations incorrect or causing unlicensed off-site impact.
IS019		Difficulty complying with EPL water quality limits in discharge leading to adverse impacts on EPL and non-EPL downstream water quality parameters.
IS017		Redirection of surface flow due to creek diversions.
IS016		Cumulative impacts (e.g. Ulan Mine Complex, Moolarben Coal Complex, Bowden Silver Project, Bylong Coal Project and Cobbora Coal Project) on downstream water users (including EPL releases).

Risk Register/Issues Output (Continued)

Ref	Environmental Issue Subject Area	Description of Issue
IS011	Noise	Cumulative impacts (e.g. Ulan Mine Complex, Moolarben Coal Complex, Bowden Silver Project, Bylong Coal Project and Cobbora Coal Project) on road/rail noise.
IS009		Potential for increased road noise (e.g. during construction).
IS001		Potential effects of operational noise and blast emissions on surrounding landowners and private lands (project specific and cumulative).
IS010	Blasting	Cumulative amenity impacts of blasting (dwellings and road closures) (e.g. Ulan Mine Complex and Moolarben Coal Complex – including blast times).
IS008		Potential effects of blasting on public roads/rail operations.
IS007		Potential effects of blasting on structures/buildings.
IS005		Potential impacts of blast fumes/vibration/air blast on surrounding landowners.
IS004		Incremental potential effects of blasting on cultural (i.e. shelters, overhangs) and historic heritage sites.
IS003		Potential effects of blasting on the TransGrid Wollar to Wellington 330kV line.
IS171		Fly-rock impacts outside the lease boundaries.
IS014	Air Quality	Water supply availability for dust suppression in dry times.
IS013		Cumulative impacts (e.g. Ulan Mine Complex, Moolarben Coal Complex, Bowden Silver Project, Bylong Coal Project and Cobbora Coal Project) on air quality.
IS006		Potential for spontaneous combustion events in stockpiles and elevated in-pit waste rock emplacements.
IS002		Potential effects of dust emissions on surrounding landowners and private lands (project specific and cumulative).
IS179		Spontaneous combustion.
IS178	Flora and Fauna	Realigned TransGrid Wollar to Wellington 330kV ETL on ECAs (offset areas).
IS052		Impacts on downstream aquatic ecology (including cumulative EPL water releases).
IS051		Increased indirect impacts on Munghorn Gap Nature Reserve and Goulburn River National Park, including reduced connectivity.
IS050		Demonstrating that the proposed offset is fit for purpose (e.g. maintains or improves regional biodiversity in medium to long term).
IS049		Potential for increased incidence of bushfires.
IS048		Slate Gully Shale mine adit entries and potential for long eared pied bat habitat.
IS047		Cumulative impacts (e.g. Ulan Mine Complex, Moolarben Coal Complex, Bowden Silver Project, Bylong Coal Project and Cobbora Coal Project) on regional biodiversity.
IS046		Cumulative vegetation, fauna habitat and threatened species impacts with the relocation of the TransGrid Wollar to Wellington 330kV transmission line.
IS045		Incremental and cumulative loss of vegetation and fauna habitat and potential impact on listed threatened species.
IS076	Agricultural Resources	Impacts on Biophysical Strategic Agricultural Land (if present).
IS075		Cumulative impacts (e.g. Ulan Mine Complex, Moolarben Coal Complex, Bowden Silver Project, Bylong Coal Project and Cobbora Coal Project).
IS074		Impacts on land capability and agricultural suitability (final land use - including loss of agricultural land in offset areas).

Risk Register/Issues Output (Continued)

Ref	Environmental Issue Subject Area	Description of Issue
IS073	Agricultural Resources	Current land usage for farming.
IS072	Heritage	Potential indirect impacts on heritage items or areas of significance (e.g. blasting).
IS071		Potential direct impacts on European heritage items or areas of significance (e.g. shale mine features).
IS070		Potential incremental direct impacts on Aboriginal heritage items or areas of significance.
IS165		Potential impacts of blasting on the Wollar Cemetery, St Laurence O'Toole Catholic Church or St Luke's Anglican Church.
IS064	Road Transport	Increased traffic on the public road network.
IS068	Visual	Visual impacts associated with the relocation of the TransGrid power line.
IS063		Visual impact of night lighting.
IS062		Visual impact of mining operations (including in-pit waste rock emplacements).
IS172	Social and Economic	Positive benefits of the Project (jobs, community).
IS069		Cumulative incremental impacts with other mining projects on community infrastructure (roads, accommodation, services).
IS067		Impacts on Wollar Shop as a regional service provider.
IS066		Impacts on Wollar Village private landholders.
IS065		Socio-economic impact of the Project.
IS059	Rehabilitation/Closure	Integration of final landform/rehabilitation with Moolarben Coal Complex and management of barrier coal.
IS058		Failure to meet rehabilitation criteria (e.g. due to seasonal or soil limitations).
IS057		Definition of rehabilitation criteria.
IS056		Topsoil stockpiles and out of pit emplacements.
IS055		Development of long-term rehabilitation and mine closure concepts that balance land use and conservation objectives.
IS054		Incremental changes to final voids and associated post-mining water management system.
IS053		Waste rock and tailings management.
IS030		Stability of final landform (erosion) and maintenance of stable drainage paths.
IS173	Approvals/Operational	Management of sub soil resources (Pit 8) (characterisation of soil resources).
IS169		Native title processes for mining lease.
IS163		Timing for application to TransGrid should allow for parallel processing with Wilpinjong Extension.
IS102		Management of public access in the vicinity of blasting zones.
IS101		Additional haul road or conveyor corridor from south end to the CHPP.
IS099		Lack of operational flexibility in the approval.
IS098		Voluntary Planning Agreement process and Ulan Road Strategy.
IS096		Site Verification/Gateway Certificate process.
IS093		Ongoing Exploration Programmes.
IS090		Water Licensing implications for groundwater extraction.
IS086		Compliance with Dust PRP requirements.
IS084		Impacts on Crown Land.

Risk Register/Issues Output (Continued)

Ref	Environmental Issue Subject Area	Description of Issue
IS083	Other Environmental	Waste management.
IS082		Road realignment.
IS081		Impacts on public utilities i.e. power lines.
IS080		Hydrocarbon management/spills.
IS078	Other Environmental	Climate change - Greenhouse Gas Emissions.
IS180		Sediment control during operation and as part of rehabilitated landform.

Attachment B – Definitions and Abbreviations

Term	Explanation
ALARP	"As Low As Reasonably Practicable". The level of risk between tolerable and intolerable levels that can be achieved without expenditure of a disproportionate cost in relation to the benefit gained.
AS	Acronym – Australian Standard
Hazard	A thing or a situation with potential to cause loss including injury or illness to a person.
HAZOP	Acronym for Hazard and Operability study – a risk engineering technique using nodes and key words to identify potential loss scenarios
Inherent/Initial Risk	The risk associated with an unwanted event before any consideration of the existing controls is taken into account.
Personnel	Includes all people working in and around the site (e.g. all contractors, sub-contractors, visitors, consultants, project managers etc.)
Practicable	The extent to which actions are technically feasible, in view of cost, current knowledge and best practices in existence and under operating circumstances of the time.
Residual Risk	The risk associated with an unwanted event after consideration of the control measures is taken into account.
Risk	The combination of the potential consequences arising from a specified hazard together with the likelihood of the hazard actually resulting in an unwanted event.
Risk Management	The systematic application of management policies, procedures and practices to the tasks of identifying, analysing, assessing, treating and monitoring risk.

Attachment C – About Your Report

Your report has been developed on the basis of your unique and specific requirements as understood by ***SP Solutions*** and only applies to the subject matter investigated. Your report should not be used or at a minimum it MUST be reviewed if there are any changes to the project and Key Assumptions. ***SP Solutions*** should be consulted to assess how factors that have changed subsequent to the date of the report affect the report's recommendations. ***SP Solutions*** cannot accept responsibility for problems that may occur due to changed factors if they are not consulted.

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- valid and factual inputs supplied by all third parties;
- key assumptions outside the influence of ***SP Solutions***; and
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