

WAMBO COAL PTY LIMITED



SOUTH BATES EXTENSION MODIFICATION ENVIRONMENTAL ASSESSMENT

APPENDIX M Environmental Risk Assessment



WAMBO COAL PTY LIMITED

SOUTH BATES EXTENSION MODIFICATION

ENVIRONMENTAL RISK ASSESSMENT

PREPARED BY WAMBO COAL PTY LIMITED AND RESOURCE STRATEGIES PTY LTD

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EXECUTIVE SUMMARY

This document is an Environmental Risk Assessment (ERA) for a proposed modification to the Wambo Coal Mine, an existing open cut and underground coal mining operation. This proposed modification involves an extension to the South Bates Underground Mine to mine additional longwall panels in the Whybrow Seam and is referred to as the South Bates Extension Modification (the Modification).

The ERA identifies environmental issues and ranks these issues in consideration of control measures. As part of the ERA, a risk review team identified the key environmental issues associated with the Modification, including those related to:

- impacts on North Wambo Creek and ephemeral creeks associated with subsidence resulting from the modified underground mine;
- impacts of subsidence on the existing North Wambo Creek Diversion;
- incremental increases in subsidence induced ponding effects on areas of agricultural land;
- potential subsidence impacts on cliffs and steep slopes; and
- potential subsidence impacts on items of Aboriginal heritage.

These issues will be covered in detail in the specialist assessment reports to be appended to the Modification Environmental Assessment, including:

- Appendix A Subsidence Assessment.
- Appendix B Groundwater Assessment.
- Appendix C Surface Water Assessment.
- Appendix D Flora Assessment.
- Appendix E Fauna Assessment.
- Appendix F Aboriginal Cultural Heritage Assessment.
- Appendix G Historic Heritage Assessment.
- Appendix H Agricultural Impact Statement.
- Appendix I Noise Review.
- Appendix J Air Quality and Greenhouse Gas Review.
- Appendix K Land Contamination Assessment.
- Appendix L Site Water Balance.

The review team risk ranked the key environmental issues and concluded that risks would be within the risk acceptance criteria and are broadly acceptable.

1 INTRODUCTION

This document is an Environmental Risk Assessment (ERA) for a proposed modification to the Wambo Coal Mine (Wambo), an open cut and underground coal mining operation which operates in accordance with Development Consent DA 305-7-2003. Wambo is owned and operated by Wambo Coal Pty Limited (WCPL), a subsidiary of Peabody Energy Australia Pty Limited (Peabody).

Wambo includes the approved South Bates Underground Mine that incorporates longwall mining in the Whybrow and Wambo Seams.

A viable coal resource in the Whybrow Seam to the north-west of the approved South Bates Underground Mine has been identified based on recent exploration results and geotechnical investigations as well as the successful mining experience in the current South Bates Underground Mine and adjacent open cut mining areas.

On the basis of this further understanding of the available resource, WCPL is proposing an extension to its South Bates Underground Mine to mine additional longwall panels in the Whybrow Seam. This proposed extension to the South Bates Underground Mine is referred to as the South Bates Extension Modification (the Modification).

1.1 OBJECTIVE AND SCOPE

The objective of this ERA is to conduct a risk assessment consistent with the Modification Secretary's Environmental Assessment Requirements, which require:

a risk assessment of the potential environmental impacts of the project, identifying the key issues.

The risk assessment included the following tasks:

- establishing the context including review of supporting information and objectives;
- identifying potential issues by review of the Modification description and similar issues from previous Wambo risk assessments;
- analysis of identified risks and nomination of key environmental issues; and
- ranking of the key issues and associated risks, including consideration of mitigation measures.

1.2 METHODOLOGY

The methodology used for this ERA was to conduct a risk assessment generally consistent with the guidance provided in Australian Standard/New Zealand Standard (AS/NZS) International Organisation for Standardisation (ISO) 31000: 2009 *Risk Management – Principles and Guidelines*.

This ERA draws on the findings of the previous risk assessments conducted at Wambo:

- *North Wambo Underground Mine – Longwalls 8 to 10A Subsidence Risk Assessment Report* (Operational Risk Mentoring, 2015a).
- *South Bates (Whybrow Seam) Underground Mine – Longwalls 11 to 13 Subsidence Risk Assessment Report* (Operational Risk Mentoring, 2015b).
- *South Bates Underground Mine – Longwalls 11 to 16 Subsidence Risk Assessment Report* (Operational Risk Mentoring, 2016).

1.3 TEAM REVIEW

Consistent with AS/NZS ISO 31000: 2009, a team review of the ERA outcomes was undertaken. Details of the team who contributed to the review are provided in Table 1.

Table 1
Team Members

Name	Role	Qualifications and Experience
Steven Peart	Peabody – Environment and Community Manager	B Sci, B Env Man; 12 years operational environmental management experience.
Jacques Abrahamse	Peabody – South Bates Project Manager	B Mining Hons; Statutory Qualifications; 30 years coal mining operational experience and project experience.
Micheal Alexander	Peabody – Director Projects and Portfolio Management (NSW)	30 years experience mining, energy and construction industry.
Josh Peters	Resource Strategies – Senior Environmental Manager	B Sci (Environment); heritage and biodiversity related issues; 14 years consulting experience.
Joanna Hinks	Resource Strategies – Senior Environmental Manager	B Eng (Env); 9 years environmental management and project approvals experience in resource industry.
Lucas Burns	Resource Strategies – Senior Environmental Manager	B Eng (Env); 11 years environmental management and project approvals experience in resource industry.

2 CONTEXT

2.1 MODIFICATION CONTEXT

Table 2 provides a comparative summary of the approved and proposed modified Wambo. The general arrangement of the approved and modified Wambo is provided as Figure 1.

Table 2
Comparative Summary of the Approved and Modified Wambo

Component	Approved Wambo ¹	Modified Wambo
Life of Mine	28 years (i.e. until 1 March 2032).	35 years (i.e. until end of 2039).
Open Cut Mining	- Open cut mining at a rate of up to 8 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal from the Whybrow, Redbank Creek, Wambo and Whynot Seams. - An estimated total open cut ROM coal reserve of 98 million tonnes (Mt). - Open cut mining operations up to and including 2020.	No changes proposed as part of this Modification.
Underground Mining	- Underground mining of up to 9.75 Mtpa of ROM coal from the Whybrow, Wambo, Woodlands Hill and Arrowfield Seams. - Underground ROM coal reserves are estimated at 143.3 Mt.	- No changes to the target coal seams of the maximum approved extraction rate. Extension of mining in the Whybrow Seam. - Approximately 18 Mt of additional ROM coal from the modified South Bates Underground Mine (i.e. from South Bates Extension).

Table 2 (Continued)
Comparative Summary of the Approved and Modified Wambo

Component	Approved Wambo ¹	Modified Wambo
Subsidence Commitments and Management	The subsidence impact performance measures listed in Conditions 22 and 22A, Schedule 4 of the Development Consent (DA 305-7-2003).	Unchanged.
ROM Coal Production Rate	Up to 14.7 Mtpa of ROM coal.	Unchanged.
Total ROM Coal Mined	241.3 Mt.	Approximately 18 Mt of additional ROM coal from the modified South Bates Underground Mine (i.e. from South Bates Extension).
Waste Rock Management	Waste rock deposited in open cut voids and in waste rock emplacements adjacent open cut operations.	No changes proposed as part of this Modification.
Total Waste Rock	640 million bank cubic metres.	No changes proposed as part of this Modification.
Coal Washing	CHPP capable of processing approximately 1,800 tonnes per hour.	No changes proposed as part of this Modification.
Product Coal	Production of up to 11.3 Mtpa of thermal coal predominantly for export under DA 305-7-2003.	Unchanged.
CHPP Reject Management	Coarse rejects and tailings would be incorporated, encapsulated and/or capped within open cut voids in accordance with existing Wambo management practices.	No changes proposed as part of this Modification.
Total CHPP Rejects	Approximately 36.6 Mt of coarse rejects and approximately 22.4 Mt of tailings.	An additional 3.7 Mt of coarse rejects and 2.1 Mt of tailings from underground mining operations.
Water Supply	Make-up water demand to be met from runoff recovered from tailings storage areas, operational areas, dewatering, licensed extraction from Wollombi Brook and Hunter River.	No changes proposed as part of this Modification.
Surface Facilities	Construction of surface facilities within the approved surface development area.	Construction of additional infrastructure within the approved surface development area.
Mining Tenements	Coal Lease (CL) 365, CL 374, CL 397, Consolidated Coal Lease 743, Mining Lease (ML) 1402, ML 1572, ML 1594, Authorisation (A) 444, Exploration Licence 7211.	An additional mining lease over A 444 would be required for the Modification.

¹ Development Consent DA 305-7-2003 (as modified).

2.2 RISK MANAGEMENT CONTEXT

It was confirmed that the ERA was to cover environmental issues only, and that issues associated with safety, business or operational issues were not intended to be covered.

The Wambo Development Consent (DA 305-7-2003) outlines a range of performance measures regarding the potential consequences of subsidence risks posed by mining. These subsidence impact performance measures are shown in Table 3.

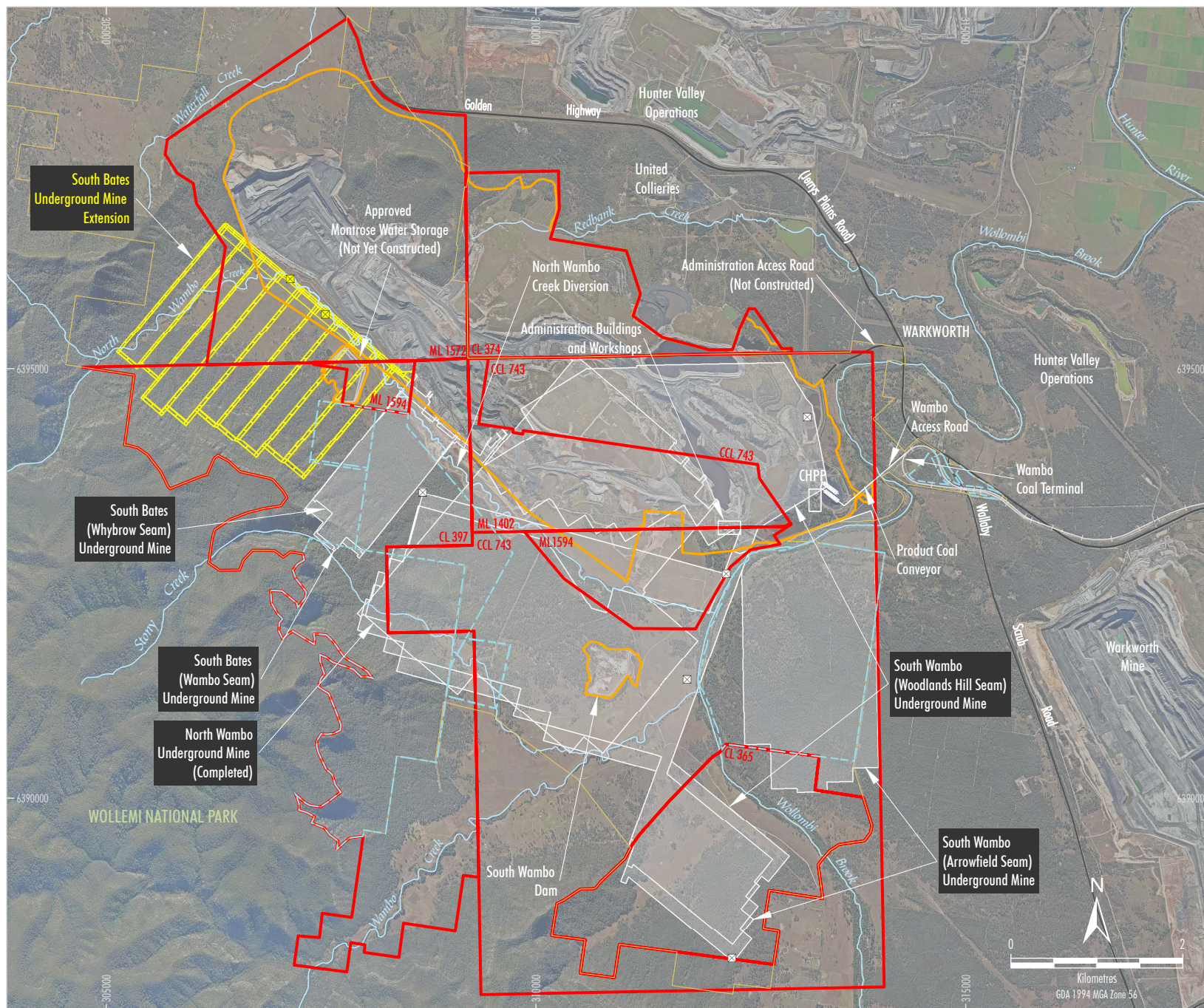


Figure 1

Table 3
Performance Measures

Feature	Subsidence Impact Performance Measure
Wollombi Brook	Negligible subsidence impacts. Negligible environmental consequences. Controlled release of excess site water only in accordance with Environment Protection Licence requirements.
Wollemi National Park	Negligible subsidence impacts. Negligible environmental consequences.
Warkworth Sands Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.
White Box, Yellow Box, Blakely's Red Gum, Woodland/Grassy White Box Woodland Community	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.
Other threatened species, populations or communities	Minor cracking and ponding of the land surface or other impact. Negligible environmental consequences.
Wambo Homestead Complex	Negligible impact on heritage values, unless approval has been granted by the Heritage Branch and/or the Minister.
All built features	Always safe. Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated. Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.
Public Safety	No additional risk.

Source: DA 305-7-2003.

2.3 RISK CRITERIA

The 'tolerability' of a risk is the willingness to live with a risk to secure benefits, on the understanding that the risk is being properly controlled (Handbook 203:2006 – *Environmental Risk Management – Principles and Process*). Legislation and good practice is targeted to reduce risk to "As Low as Reasonably Practicable" (ALARP).

Consistent with recent Wambo risk assessments (Operational Risk Mentoring, 2015a, 2015b, 2016), the criteria adopted in this ERA is to treat risks to achieve an ALARP ranking, or lower.

3 RISK ASSESSMENT

3.1 RISK IDENTIFICATION

The process used for risk identification was to compile potential risks relevant to the Modification from recent risk assessments conducted at Wambo, tailoring these risks for the Modification and identifying new risks where previously identified risks did not cover the full breadth of the Modification. The identified risks were reviewed and confirmed by the team members (Table 1).

3.2 RISK ANALYSIS

Consistent with the objectives of the ERA (i.e. *a risk assessment of the potential environmental impacts of the project, identifying the key issues*) (Section 1.1), a selection of the risks identified through the process described in Section 3.1 were identified by the team members to be the key issues for the Modification ERA. The key issues are presented in Table 4 below.

Table 4
Key ERA Issues

Ref	Issue	Aspect
SBE001	Subsidence impacts and incremental ponding of agricultural land.	Agricultural
SBE002	Subsidence impacts on North Wambo Creek (upper reach), including cracking of stream bed and loss of surface flow.	Surface Water
SBE003	Cumulative noise impacts associated with the United Wambo Open Cut Coal Mine Project.	Noise and Blasting
SBE004	Cumulative air quality impacts associated with the United Wambo Open Cut Coal Mine Project.	Air Quality
SBE005	Mine subsidence impacts resulting in impacts on vegetation along the North Wambo Creek (upper reach).	Flora/Fauna
SBE006	Mine subsidence impacts resulting in impacts on the conservation values of the United Wambo Open Cut Coal Mine Project biodiversity offset area.	Flora/Fauna
SBE007	Mine subsidence impacts resulting in impacts on cliffs and steep slopes.	Land
SB010	North Wambo Creek Diversion damaged by subsidence.	Surface Water
SB046	Creation of subsidence monitoring tracks affects the conservation values of the Remnant Woodland Enhancement Program (RWEPP) areas.	Flora/Fauna
SB020	Subsidence impacts and surface disturbance resulting in loss of habitat for threatened species.	Flora/Fauna
SB012	Unintended subsidence impacts resulting in rock instability of the Wollemi National Park escarpment and associated environmental consequences.	Land
SB045	Induced leakage from North Wambo Creek Diversion due to subsidence.	Surface Water
SB028	Mine subsidence impacts on items of Aboriginal heritage.	Archaeological/Heritage
SB016	Subsidence impacts on RWEPP and other biodiversity offset areas reducing biodiversity values.	Flora/Fauna
SB019	Mine subsidence impacts resulting in impacts on vegetation along the North Wambo Creek Diversion.	Flora/Fauna
SB057	Subsidence impacts resulting in injury to livestock.	Agricultural
SB011	North Wambo Creek Diversion damaged by subsidence resulting in reduced flow affecting downstream water quality.	Surface Water
SB054	A change in flood regimes or extent of potential inundation due to subsidence.	Surface Water

Note: Issues with a 'Ref' prefix 'SB' sourced after Operational Risk Mentoring (2016).

3.3 RISK EVALUATION

Risk ranking was undertaken by the team using qualitative measures of likelihood and consequence provided in Tables 5 and 6, respectively. These were combined to form a quantitative measure of risk outlined in Table 7.

The risk evaluation was undertaken with consideration of the effective implementation of planned controls (Section 4).

Table 5
Qualitative Measures of Likelihood

Rank (L)	Likelihood	Description
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.

Source: Operational Risk Mentoring (2015b).

Table 6
Qualitative Measures of Consequence

Ref (C)	Consequence	Comment
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.

Source: Operational Risk Mentoring (2015b).

Table 7
Risk Ranking Table

		Likelihood (L)				
		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)

Source: Operational Risk Mentoring (2015b).

Notes:

L = Low; M = Moderate; H = High

Risk Numbering:

1 = highest risk, 25 = lowest risk

Legend:

	Broadly Acceptable
	ALARP – As low as reasonably practicable
	Intolerable

4 RISK TREATMENT

The Risk Treatment Plan was developed by the team (Table 8). The table is ordered by aspect type and priority.

Table 8
Risk Treatment Plan

Ref	Issue	Aspect	Planned Controls	L	C	R
SB028	Mine subsidence impacts on items of Aboriginal heritage.	Archaeological/Heritage	Consultation with Registered Aboriginal Parties. Implementation of Aboriginal Heritage Impact Permit process and Heritage Management Plan. Due diligence process for surface disturbance (Surface Disturbance Permit process).	C	5	22
SB019	Mine subsidence impacts resulting in impacts on vegetation along the North Wambo Creek Diversion.	Flora/Fauna	Implementation of the Extraction Plan, Biodiversity Management Plan, bed and bank stability monitoring, flora and fauna monitoring program, visual inspections and remediation.	C	5	22
SBE005	Mine subsidence impacts resulting in impacts on vegetation along North Wambo Creek (upper reach).	Flora/Fauna	Implementation of the Extraction Plan, Biodiversity Management Plan, bed and bank stability monitoring, flora and fauna monitoring program, visual inspections and remediation.	C	5	22
SBE006	Mine subsidence impacts resulting in impacts on the conservation values of the United Wambo Open Cut Coal Mine Project biodiversity offset area.	Flora/Fauna	Implementation of the Extraction Plan, Biodiversity Management Plan, bed and bank stability monitoring, flora and fauna monitoring program, visual inspections and remediation.	C	5	22
SB046	Creation of subsidence monitoring tracks affects the conservation values of the RWEF areas.	Flora/Fauna	Adherence to Surface Disturbance Permit as per Flora and Fauna Management Plan.	C	5	22
SB016	Subsidence impacts on RWEF and other biodiversity offset areas reducing biodiversity values.	Flora/Fauna	Implementation of the Extraction Plan, Biodiversity Management Plan, bed and bank stability monitoring, flora and fauna monitoring program, visual inspections and remediation.	D	5	24
SB020	Subsidence impacts and surface disturbance resulting in loss of habitat for threatened species.	Flora/Fauna	Implementation of the Extraction Plan, Biodiversity Management Plan, vegetation clearance protocol, bed and bank stability monitoring, flora and fauna monitoring program, visual inspections and remediation.	E	5	25
SBE001	Subsidence impacts and incremental ponding of agricultural land.	Agricultural	Implementation of Extraction Plan and Land Management Plan, including monitoring and mitigation of ponding impacts.	D	4	21
SB057	Subsidence impacts resulting in injury to livestock.	Agricultural	Implementation of Public Safety Management Plan (particularly notification and fencing requirements).	E	5	25

Table 8 (Continued)
Risk Treatment Plan

Ref	Issue	Aspect	Planned Controls	L	C	R
SBE007	Mine subsidence impacts resulting in impacts on cliffs and steep slopes.	Land	Implementation of Extraction Plan and Land Management Plan. Identification of cliff lines that are associated with the Wollemi National Park with appropriate mine design offsets applied.	D	3	17
SB012	Unintended subsidence impacts resulting in rock instability of the Wollemi National Park escarpment and associated environmental consequences.	Land	Implementation of Extraction Plan, Land Management Plan and Public Safety Management Plan. Identification of cliff lines that are associated with the Wollemi National Park with appropriate mine design offsets applied.	E	3	20
SB045	Induced leakage from North Wambo Creek Diversion due to subsidence.	Surface Water	Implementation of Water Management Plan and subsidence remediation.	D	3	17
SBE002	Subsidence impacts on North Wambo Creek (upper reach), including cracking of stream bed and loss of surface flow.	Surface Water	Implementation of Extraction Plan and Water Management Plan, including bed and bank stability monitoring and remediation.	D	3	17
SB010	North Wambo Creek Diversion damaged by subsidence.	Surface Water	Adequate design of North Wambo Creek Diversion. Implementation of the Extraction Plan. Implementation of a Trigger Action Response Plan for crack remediation.	D	4	21
SB011	North Wambo Creek Diversion damaged by subsidence resulting in reduced flow affecting downstream water quality.	Surface Water	Implementation of Extraction Plan and Water Management Plan, including bed and bank stability monitoring and remediation.	D	4	21
SB054	A change in flood regimes or extent of potential inundation due to subsidence.	Surface Water	Implementation of Extraction Plan and Water Management Plan, including monitoring and remediation.	D	5	24
SBE003	Cumulative noise impacts associated with the United Wambo Open Cut Coal Mine Project.	Noise and Blasting	Underground mining method employed and implementation of Noise Monitoring Plan.	D	4	21
SBE004	Cumulative air quality impacts associated with the United Wambo Open Cut Coal Mine Project.	Air Quality	Underground mining method employed and implementation of Air Quality and Greenhouse Gas Management Plan.	D	4	21

5 MONITORING AND REVIEW

5.1 NOMINATED COORDINATOR

The nominated coordinator is the WCPL Environment and Community Manager. The coordinator should coordinate review of the ERA content and confirm its accuracy.

5.2 IMPLEMENTATION REVIEW PLAN

It is important to confirm the controls and actions identified are appropriately managed. The expectation of the team was that the WCPL Environment and Community Manager would coordinate and monitor all controls identified within the ERA.

5.3 COMMUNICATION AND CONSULTATION

Communication and consultation form an integral part of the risk management process. It is the WCPL Environment and Community Manager's responsibility to confirm that this report is shared with all relevant personnel and other stakeholders as appropriate.

5.4 CONCLUSIONS

A review team identified the key environmental issues associated with the Modification. These issues will be covered in detail in the specialist assessment reports to be appended to the Modification Environmental Assessment, including:

- Appendix A Subsidence Assessment.
- Appendix B Groundwater Assessment.
- Appendix C Surface Water Assessment.
- Appendix D Flora Assessment.
- Appendix E Fauna Assessment.
- Appendix F Aboriginal Cultural Heritage Assessment.
- Appendix G Historic Heritage Assessment.
- Appendix H Agricultural Impact Statement.
- Appendix I Noise Review.
- Appendix J Air Quality and Greenhouse Gas Review.
- Appendix K Land Contamination Assessment.
- Appendix L Site Water Balance.

The review team risk ranked the identified key environmental issues and concluded that risks would be within the acceptable criteria and generally 'low' in nature.

6 REFERENCES

Operational Risk Mentoring (2015a) *North Wambo Underground Mine – Longwalls 8 to 10A Subsidence Risk Assessment Report*.

Operational Risk Mentoring (2015b) *South Bates (Whybrow Seam) Underground Mine – Longwalls 11 to 13 Subsidence Risk Assessment Report*.

Operational Risk Mentoring (2016) *South Bates Underground Mine – Longwalls 11 to 16 Subsidence Risk Assessment Report*.