

# **VICKERY EXTENSION PROJECT**

## **ENVIRONMENTAL IMPACT STATEMENT**

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# **APPENDIX 0**

## **ENVIRONMENTAL RISK ASSESSMENT**



# Operational Risk Mentoring

Practical Solutions for Operational Risk Management

## Vickery Extension Project

### Environmental Risk Assessment

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Whitehaven Coal Limited

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<b>Key Supporting Documentation</b>	<ul style="list-style-type: none"> <li>AS/NZ ISO 31000:2009 <i>Risk Management – Principles and Guidelines</i> (Standards Australia, 2009) (note also conforms with ISO 31000:2018 <i>Risk Management – Guidelines</i>);</li> <li>HB 203:2006 <i>Environmental Risk Management – Principles and Process</i> (Standards Australia, 2006);</li> <li>MDG1010 <i>Minerals Industry Safety and Health Risk Management Guideline</i> (Department of Trade and Investment, 2011); and</li> <li>Secretary's <i>Environmental Assessment Requirements for the Vickery Extension Project</i>.</li> </ul>

### Versions

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- Attachment A – Definitions
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# 1 INTRODUCTION

The former Vickery Coal Mine and the former Canyon Coal Mine are located approximately 25 kilometres (km) north of Gunnedah, in New South Wales (NSW) (Figure 1). Open cut and underground mining activities were conducted at the former Vickery Coal Mine between 1986 and 1998. Open cut mining activities at the former Canyon Coal Mine ceased in 2009. The former Vickery and Canyon Coal Mines have been rehabilitated following closure.

The approved Vickery Coal Project (herein referred to as the Approved Mine) is an approved, but yet to be constructed, project involving the development of an open cut coal mine and associated infrastructure, and would facilitate a run-of-mine (ROM) coal production rate of up to approximately 4.5 million tonnes per annum (Mtpa) for a period of 30 years.

Whitehaven Coal Limited (Whitehaven) is seeking a new Development Consent for extension of open cut mining operations at the Approved Mine (herein referred to as the Vickery Extension Project [the Project]). This would include a physical extension to the Approved Mine footprint to gain access to additional ROM coal reserves, an increase in the footprint of waste rock emplacement areas, an increase in the approved ROM coal mining rate and construction and operation of a Project Coal Handling and Preparation Plant (CHPP), train load-out facility and rail spur. This infrastructure would be used for the handling, processing and transport of coal from the Project, as well as other Whitehaven mines.

This document is an Environmental Risk Assessment (ERA) which identifies potential impacts associated with key potential environmental issues associated with the Project. The document draws on the outcomes of an ERA previously conducted for the Approved Mine (Safe Production Solutions, 2012), where relevant.

## 1.1 AIM AND OBJECTIVES

The aim of the ERA workshop was:

*To identify key environmental issues for further assessment in the Environmental Impact Statement.*

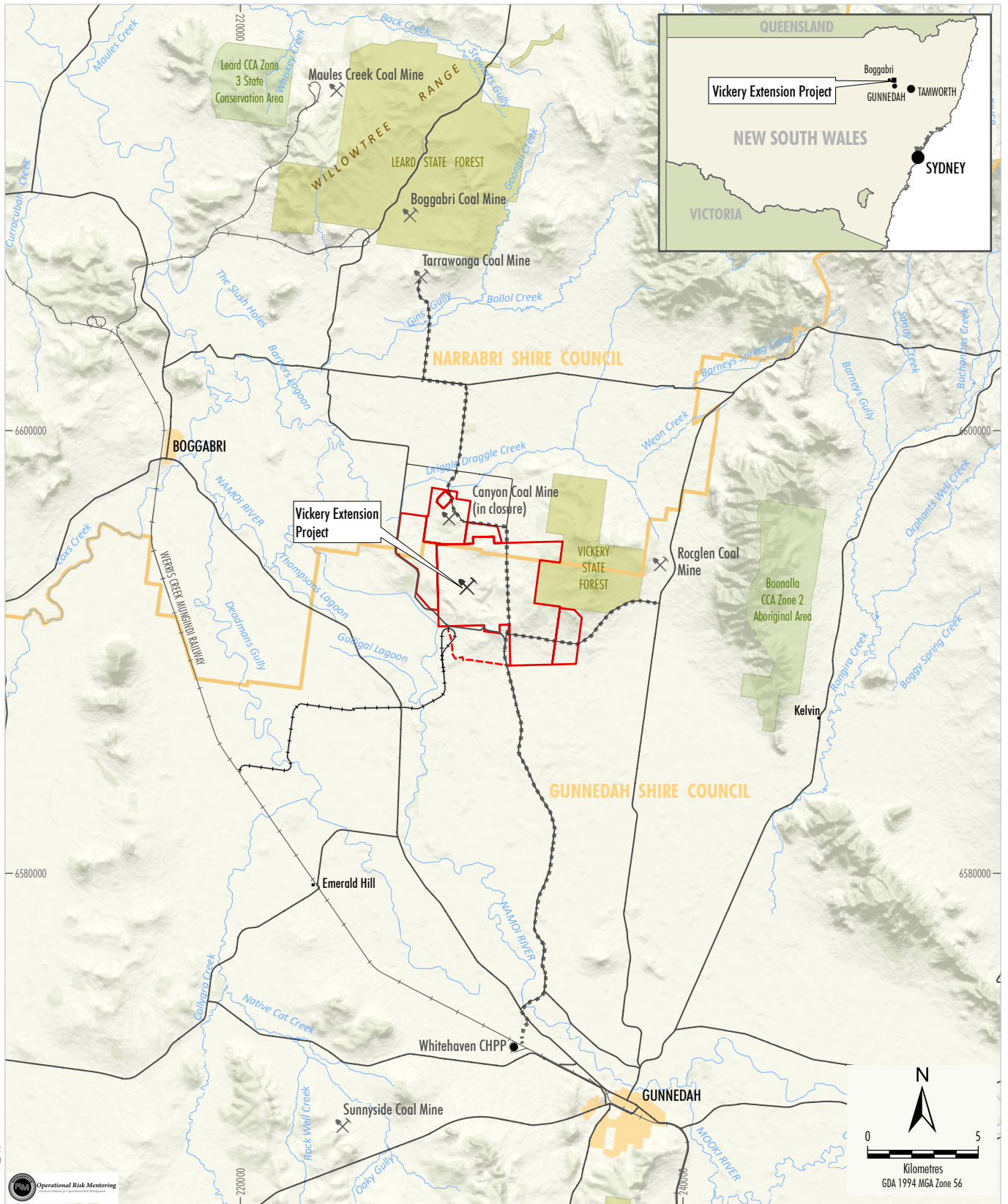
The primary objectives of this ERA were to:

- identify the key potential environmental issues associated with the Project; and
- 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 overall Whitehaven management; and
2. a revised document suitable for inclusion in the Project EIS and prepared in accordance with Australian Standard/ New Zealand Standard International Standards Organisation (AS/NZS ISO) 31000:2009 *Risk Management – Principles and Guidelines* (AS/NZS ISO 31000:2009).

A list of terms and their definitions is provided in Attachment A.

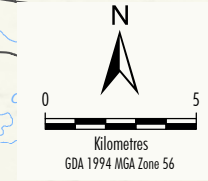


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**LEGEND**

- Mining Tenement Boundary (ML & CL)
- Mining Lease Application (MLA)
- Local Government Boundary
- State Forest
- State Conservation Area, Aboriginal Area
- Major Roads
- Railway
- Approved Road Transport Route
- Indicative Project Rail Spur



**VICKERY EXTENSION PROJECT**  
Project Location

Source: LPMA - Topographic Base (2010); NSW Department of Industry (2015)

**Figure 1**

## 1.2 CLIENT

The client for the ERA is Whitehaven.

## 1.3 SCOPE

The scope of the ERA was to:

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

This ERA focuses on risk and does not comprehensively consider opportunities or benefits of the Project (with the exception of recognising the socio-economic benefits). A Project justification is provided in Section 6 of the Main Report of the EIS.

## 1.4 CLARIFYING POINTS

The following clarifying points regarding the scope were made:

- Safety issues were not intended to be covered.
- The geographical extent of the Project area was understood to include the Development Application area which is described in the Preliminary Environmental Assessment and includes additional disturbance areas relative to the currently Approved Mine, including the Project rail spur.
- Changes considered in the desktop review (Section 1.5) were the additional disturbed area, construction and operation of a Project CHPP facility, modified transport options and realignment of surrounding roads.

## 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 HB 203:2006 *Environmental Risk Management – Principles and Process* [HB 2003:2006]).

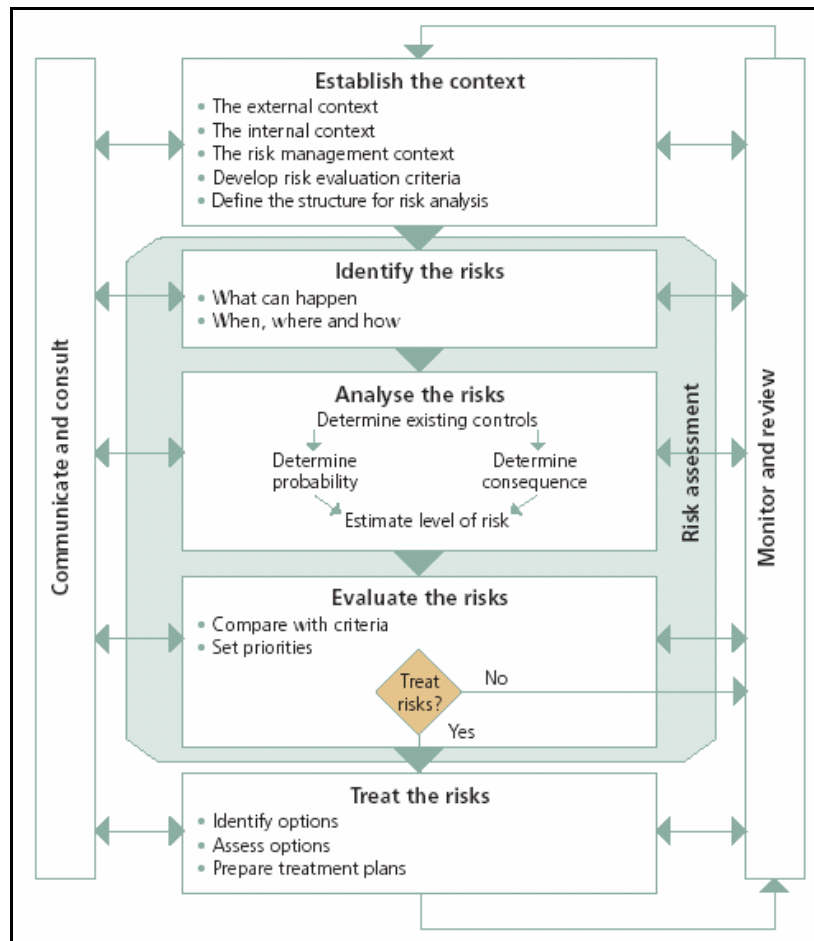
This ERA draws upon the outcomes of a team workshop in July 2012, which were subsequently updated via a further team review in March 2016.

## 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. a team of subject matter experts available to review the online version of the modified report;
3. external facilitators for the risk assessment and write-up of results; and
4. aerial photographs, drawings, the Secretary's Environmental Assessment Requirements (SEARs) for the Project and other supporting information.





Source: after AS/NZS ISO 31000:2009.

Figure 2 – Risk Management Process

The outcomes of the ERA and associated accountabilities will be integrated into the EIS and overall Whitehaven 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. This framework is further discussed in Section 1.7.2 with respect to the subject area.

### 1.7.2 Key Steps

Key steps undertaken at either the July 2012 workshop or March 2016 update are presented below. 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. conduct a team-based risk assessment that:
  - a) identified hazards and assessed the level of risk; and
  - b) developed a list of recommended controls to treat the risk (through prevention, monitoring, management and rehabilitation strategies);
5. reviewing the report produced from the earlier Approved Mine ERA in the light of the planned changes associated with the Project - undertaken with a team of suitably experienced personnel using an online sharing process;
6. prepare a draft report in accordance with AS/NZS ISO 31000:2009 and MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* (Department of Trade and Investment, 2011) for review by Whitehaven personnel and ERA team members;
7. incorporate comments from Whitehaven and the ERA team; and
8. finalise the report and issue as 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 risks’, ‘analyse risks’, ‘evaluate risks’ and ‘treat risks’ phases.

As described in Section 1.1, the outcomes of the ERA and associated accountabilities will be integrated into the EIS and overall Whitehaven management systems so that they are effectively reviewed, implemented and monitored.

### 1.7.3 External Facilitation

The team was facilitated through the process by **Operational Risk Mentoring** – a company specialising in Risk Assessment and risk management programmes. The facilitator, Dr Peter Standish, is experienced with open cut coal mining and many aspects of environmental monitoring and rehabilitation.

The team was encouraged and “challenged” to identify a wide range of environmental impacts or hazards.

It is important to understand that the outcomes of this ERA:

1. are process driven;
2. challenge current thinking and may not necessarily appear appropriate or reflect “pre-conceived” ideas; and
3. are the result of the team assembled to review the topic and not the result of any one individual or organisation.

## 2 ESTABLISH THE CONTEXT

### 2.1 PROJECT SUMMARY

The Project involves mining the coal reserves associated with the Approved Mine, as well as accessing additional coal reserves within the Project area. ROM coal would be mined by open cut methods at an average rate of 7.2 Mtpa over 25 years, with a peak production of up to approximately 10 Mtpa.

As described in Section 1, the Project would include a physical extension to the Approved Mine footprint to gain access to additional ROM coal reserves, an increase in the footprint of waste rock emplacement areas, an increase in the approved ROM coal mining rate and construction and operation of the Project CHPP, train load-out facility and rail spur (Figure 3). This infrastructure would be used for the handling, processing and transport of coal from the Project, as well as other Whitehaven mining operations.

Figure 3 illustrates the general arrangement of the Project. A detailed description of the Project is provided in Section 2 in the Main Report of the EIS.

This assessment forms part of an EIS which has been prepared to accompany a Development Application made for the Project in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act, 1979*.

### 2.2 RISK MANAGEMENT CONTEXT

This ERA has been conducted in accordance with the SEARs for the Project (Section 1.3).

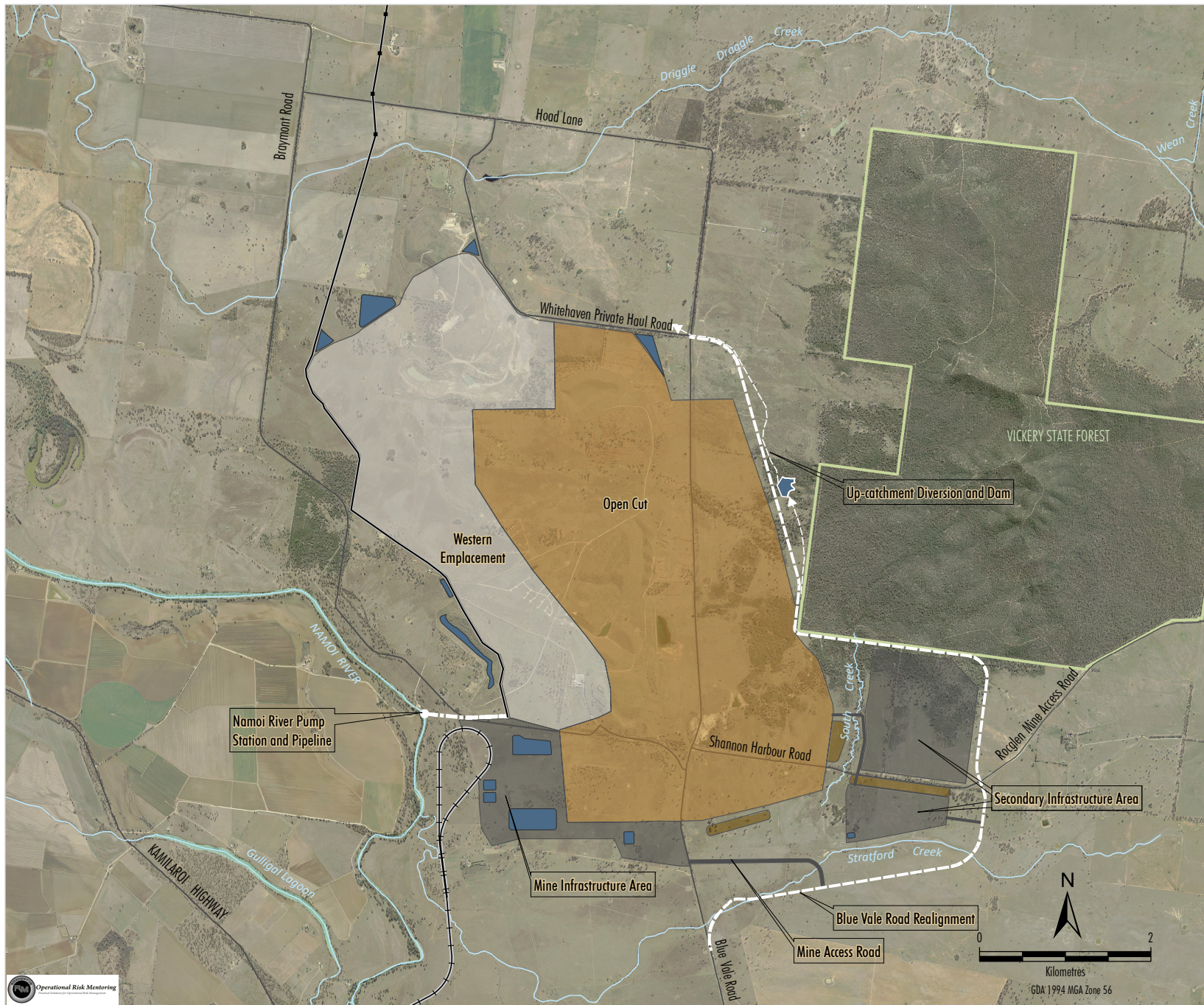
In addition, the ERA was prepared cognisant of the following documents:

- AS/NZ ISO 31000:2009;
- *Vickery Extension Project - Project Summary and Preliminary Environmental Assessment* (Whitehaven, 2016);
- HB 203:2006; and
- MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* (Department of Trade and Investment, 2011).

The *Vickery Extension Project - Project Summary and Preliminary Environmental Assessment* was submitted in January 2016. The key potential environmental impacts identified in the *Vickery Extension Project - Project Summary and Preliminary Environmental Assessment* relating to the Project were also considered in this ERA.

### 2.3 RISK CRITERIA

The risk criterion 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. The middle zone is referred to as the ALARP zone.



- LEGEND**
- State Forest
  - Project Components**
  - Indicative Extent of Open Cut
  - Indicative Extent of Out of Pit Waste Rock Emplacement
  - Indicative Extent of Infrastructure Area
  - Indicative Extent of Soil Stockpile
  - Indicative Extent of Water Storage
  - Indicative Mine Access Road Alignment
  - Indicative Namoi River Pump Station and Pipeline
  - Indicative Road Realignment
  - Indicative Up-catchment Diversion and Dam Location
  - Indicative Rail Spur Alignment
  - Indicative Location of Groundwater Bores and Pipeline

Source: Orthophoto - Department of Land and Property Information, Aerial Photography (July 2011); Department of Industry (2015); Essential Energy (2015)



**VICKERY EXTENSION PROJECT**  
**Project General Arrangement -**  
**Project Mining Area**

**Figure 3**

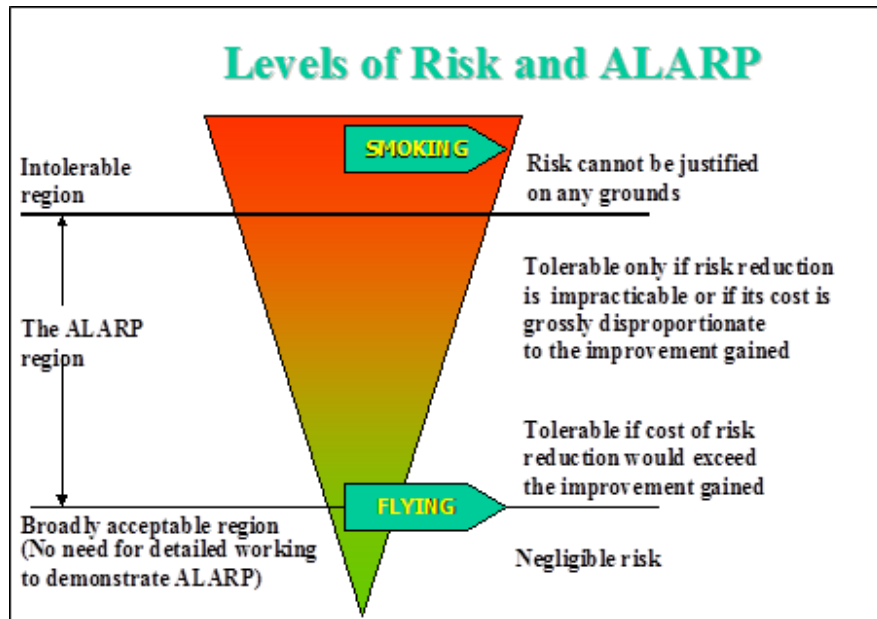


Figure 4 – Risk Criteria "ALARP"

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 from a risk perspective. This is shown graphically in Figure 4. Intolerable items such as smoking are at the top of the pyramid where much lower risks, such as flying, sit at the lower end of the ALARP zone (close to tolerable).

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

## 3 IDENTIFY RISKS

### 3.1 OVERVIEW

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.
- Brain/writing-storming – 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 (HAZOP) analysis – this involved the review of key words (drawn from the SEARs for the Project) and aerial photographs, and the consequent identification of potential environmental issues at each location during each phase of operation.
- Online issues collection – with team members participating in a process similar to the Modified HAZOP process, but using an online technique allowing for real time and sequential input to the study.

### 3.2 ENVIRONMENTAL RISK ASSESSMENT TEAM

The initial review team met for the ERA workshop in Sydney on the 6<sup>th</sup> of July 2012 and a subsequent team review was undertaken during March 2016. A team based approach was utilised in order to have an appropriate mix of skills and experience to identify the potential environmental issues and potential loss scenarios. Details of the team members and their relevant qualifications and experience are included in Table 1.

Following the 2016 workshop some refinements of the Project layout were made, specifically, reducing the mining extent, revising the mine infrastructure area location and revising the Project rail spur alignment. No change to the peak production rate, mining methodology, mining fleet or infrastructure requirements were made as part of these refinements.

A review of the ERA workshop findings (as described in Sections 3, 4 and 5) was conducted by key members of ERA team in April 2018 which confirmed the identified risks and rankings remain valid for the revised Project layout.

### 3.3 RISK IDENTIFICATION

#### 3.3.1 *Brainstorming*

The brainstorming process is intended to allow for a relatively unstructured, free flowing series of issues and ideas to be generated. 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/loss scenario when reading through the material.

Issues identified during the brainstorming session are presented in the consolidated listing of issues identified in Attachment B.

*Table 1 – ERA Team*

Name	Position/Affiliation	Relevant qualifications and experience	Teams
Brian Cole	Executive General Projects Delivery - Whitehaven Coal	BE (Civil) (Hons), M Eng Science, MBA, Fellow IE Aust, C P Eng., M AIMM. More than 35 years of experience in heavy engineering projects and operations at an executive level in the energy related sector.	2016
Mark Edmondson	General Manager – Technical Services - Whitehaven Coal	BE (Mining) (Hons). Approximately 25 years experience in the mining industry.	2016
Stuart Brown	Senior Hydrologist – HydroSimulations	PhD(Geology), MSc(Hydrogeology), MBA. 22 years experience in hydrogeological, geological and environmental projects in Australia and overseas.	2016
Aaron Hagenbach	Senior Environmental Manager - Resource Strategies	BE (Environmental). 16 years experience environmental management and project approvals in resource industry.	2016
Peter Standish	Facilitator - OpRM	PhD, BE (Hons), Dip Bus Mgt, Risk Analysis Trained. Certificate of Competence as a Manager. 33 years experience in underground and open cut mining operations with operating, managerial and contract management experience. Involved in reviewing environmental conditions and applications for 5 years. Conducting Risk Analyses for 12 years.	Both
Steve Perrens	Specialist Advisor – Advisian	BE, MEng (Sci), PhD. Over 40 years experience in water management and assessment.	Both
Clive Berry	Senior Environmental Manager - Resource Strategies	BE (Environmental). 14 years experience environmental management and project approvals in resource industry.	Both
Tom Mackillop	Environmental Manager - Resource Strategies	BE (Environmental); BSc. 9 years experience environmental management.	Both
James Steele	Environmental Manager - Resource Strategies	BE (Environmental); BA. 9 years experience environmental management.	Both
Danny Young	Group Environmental Manager - Whitehaven Coal	BSc (Environmental). 5 years mining experience, 15 years total experience.	2012
Ben Bomford	Vickery Project Development Manager - Whitehaven Coal	BE (Mechanical). Over 15 years industrial experience.	2012
Noel Merrick	Principal - HydroSimulations	Phd, MSc, Gdip (DP), BSc, Groundwater modeller, hydrogeologist and geophysicist. 40 years experience.	2012
Adam Koutsamanis	Consultant - Advisian	BE (Environmental), MEnvLaw. Over 3 years experience in water management and assessment.	2012
Chris Gippel	Director - Fluvial Systems	BSc (Hons), PhD. 30 years experience in hydrology and geomorphology.	2012
David McKenzie	Director- McKenzie Soil Management	BNat Res, Msci(Ag), PhD. Over 30 years experience in soil resource assessment.	2012
Rhidian Harrington	Director - Niche Environment and Heritage	BSc (Hons), MSc, PhD. Over 15 years experience in ecological assessment.	2012
Richard Kirwood	Principal - Resource Strategies	BSc (Geology); Grad Dip Nat Res. 20 years experience in mining related environmental consulting.	2012

### **3.3.2 Modified HAZOP**

The next “tool” applied with the team was that of a modified HAZOP. In this process the aerial photographs of the site were referred to along with a consideration of the phases of operation and the potential impacts that could arise.

The generic key words used in the HAZOP process representing environmental issue subject areas (generally based on the headings in the SEARs for the Project) were:

- Surface Water;
- Groundwater;
- Noise and Blasting;
- Air Quality;
- Soil and Land Resource;
- Fauna (Terrestrial and Aquatic);
- Flora;
- Visual;
- Road Transport;
- Socio-Economic;
- Land Contamination;
- Aboriginal Cultural Heritage;
- Historic Heritage; and
- Geochemistry.

### **3.3.3 Identification of Key Environmental Issue Types**

Key potential environmental issues identified for the Approved Mine were reviewed by participants of the 2016 team review to confirm that key issues associated with the Project are captured and add additional issues where appropriate (Table 2).



**Table 2 – Key Potential Environmental Issues**

Ref	Environmental Issue Subject Area	Description of Issue/Loss scenario
V031	Noise and Blasting	Mine site noise emissions and potential effects on surrounding landholders.
V123	Surface Water	Increased leakage of, or reduced base flow to, the Namoi River due to depressurisation of aquifers.
V025	Groundwater	Long-term changes to groundwater levels, flow direction and quality in the vicinity of the final void.
V089	Visual	Visual impact of waste rock emplacements and mining infrastructure, including lighting.
V134	Groundwater	Seepage from the Western Emplacement to alluvial materials adjacent to the Canyon Coal Mine final void leading to potential groundwater and surface water quality impacts.
V007	Biodiversity	Cumulative impacts of multiple existing and proposed mine developments on regional biodiversity in the Gunnedah Basin.
V059	Soil and Land Resource	Long-term geotechnical stability of final landforms.
V067	Soil and Land Resource	Success/performance of rehabilitation post-mining.
V096	Surface Water	Changes to flooding characteristics due to construction of the Project rail spur.
V121	Soil and Land Resource	Suitable soil management and storage for future use in rehabilitation.
V055	Soil and Land Resource	Development of long-term rehabilitation and mine closure concepts that balance land use and conservation objectives (final void management/acceptability).
V002	Soil and Land Resource	Impacts on agricultural resources disturbed as a result of mining activities.
V005	Biodiversity	Demonstrating the proposed offset is fit for purpose and in sufficient quantity.
V091	Surface Water	Adverse impacts on downstream water quality parameters that could have consequential effects on ecology or beneficial use.
V022	Biodiversity	Vegetation clearance related impacts on flora, fauna and their habitats.
V035	Air Quality	Potential effects of dust emissions on surrounding landowners.
V039	Noise and Blasting	Ground vibration and airblast effects on amenity of nearby receivers and buildings.
V074	Soil and Land Resource	Changes to the potential land uses directly disturbed or otherwise impacted as a result of mining activities.
V099	Surface Water	Insufficient site water flow/use monitoring data to enable model calibration which could cast doubt over predictions of water excess or shortfall.
V113	Surface Water	Seepage/runoff from mine disturbance areas bypassing water management systems and migrating offsite with possible downstream contamination.
V118	Surface Water	Mine water discharge in the event of extreme weather events.
V124	Surface Water	Licensed extraction from the Namoi River.
V142	Heritage	Potential indirect impacts on the Kurrumbede homestead and other associated nearby heritage items.
V143	Noise	Noise associated with Project rail movements on the Project rail spur.

The key potential environmental issues identified in the ERA will be addressed in appropriately detailed assessments in the Main Report of the EIS and the specialist's reports (where relevant) included as appendices to the EIS, as follows:

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

#### **3.3.4 Referred Issues**

Where issues raised during the ERA workshop brainstorming were: outside the scope of the ERA; outside of the Project scope; and/or beyond the control of Whitehaven, and therefore not considered to be key potential environmental issues, these “referred issues” were considered to warrant consideration in the development of the EIS.

The team did not identify any referred issues, however it was clarified that community engagement issues are addressed in the Project stakeholder engagement strategy. The outcomes of stakeholder engagement undertaken for the Project are outlined in Section 3 in the Main Report of the EIS.

## 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 decided 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<sup>1</sup>) should the event occur.

Tables 3 to 5 present the ERA matrix tools that were utilised for ranking risks.

*Table 3 – Qualitative Measures of Probability*

Rank (P)	Probability	Descriptor
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 4 – Qualitative Measures of Maximum Reasonable 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.

<sup>1</sup> Note: MRC: The worst-case consequence that could reasonably be expected, given the scenario and based upon experience at the operation and within the mining industry.

Table 5 – Risk Ranking Table

Consequence (C)	Probability (P)				
	A	B	C	D	E
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)

Notes:

L = Low; M = Moderate; H = High

Risk Numbering:

1 = highest risk, 25 = lowest risk

Legend:

Risk Levels:

	Tolerable
	ALARP
	Intolerable

## 4.2 RISK RANKING

Risk ranking was undertaken by the team on loss scenarios based on the key potential environmental issues (provided in Table 6).

**Table 6 – Risk Ranking Results**

Ref.	Environmental Issue Subject Area	Key Issue	Ranking Basis/Loss Scenario	C	P	R
V035	Air Quality	Potential effects of dust emissions on surrounding landowners.	<p>Considered air quality and emissions associated with the mining fleet, mining method, crushing and processing of ROM coal.</p> <p>Mitigated by haul road watering, progressive rehabilitation, real time dust monitoring and management, private agreements and property acquisition.</p>	4	C	18(L)
V007	Biodiversity	Cumulative impacts of multiple existing and proposed mine developments on regional biodiversity in the Gunnedah Basin.	<p>Considered the cumulative loss of biodiversity associated with the existing/historic and proposed mining operations in the Gunnedah Basin and the current baseline.</p> <p>Mitigated by the potential for integration of existing mining operations and/or associated infrastructure with future mining operations and integration of biodiversity offsets.</p>	5	A	15(M)
V134	Groundwater	Seepage from the Western Emplacement to alluvial materials adjacent to the Canyon Coal Mine final void leading to potential groundwater and surface water quality impacts.	<p>Considered the potential for seepage from waste rock and coal rejects placed within the Canyon Coal Mine void to report to the alluvial materials.</p> <p>Mitigated by the selective placement of potentially acid forming waste rock such that any seepage drains away from the alluvial materials.</p>	5	D	24(L)
V025	Groundwater	Long-term changes to groundwater levels, flow direction and quality in the vicinity of the final void.	<p>Considered the depressurisation of groundwater and creation of a local pit lake in the final void. Considered that the pit lake is likely to be saline in the longer term with potential to affect adjoining water resources (i.e. potential for reduction of water quality).</p> <p>Risk evaluated on the assumption that the final void is a groundwater sink. Noted that spills from the void are not predicted.</p>	5	A	15(M)
V123	Surface Water	Increased leakage of, or reduced base flow to, the Namoi River due to depressurisation of aquifers.	<p>Considered impacts to the Namoi River as a result of groundwater depressurisation associated with mining operations.</p> <p>Mitigated through the location of the final voids away from the Namoi River.</p>	5	B	19(L)
V031	Noise and Blasting	Mine site noise emissions and potential effects on surrounding landholders.	<p>Considered the site noise emissions including employment of a large truck fleet to move ROM coal and waste rock.</p> <p>Mitigated through the use of noise attenuated haul trucks and dozers, modification of mining activities on exposed portions of the waste rock emplacement during adverse meteorological conditions.</p>	4	B	14(M)

**Table 6 – Risk Ranking Results (Continued)**

Ref.	Environmental Issue Subject Area	Key Issue	Ranking Basis/Loss Scenario	C	P	R
V143	Noise and Blasting	Noise associated with rail movements on the Project rail spur.	<p>Considered the potential for an increase in noise due to increased rail movements on the Project rail spur.</p> <p>Mitigated through detailed rail design (e.g. installation of appropriate noise bunds and train speeds).</p>	5	B	19(L)
V039	Noise and Blasting	Ground vibration and air blast effects on amenity of nearby receivers and buildings (i.e. exceedance of structural damage criteria and human amenity criteria).	<p>Considered the blast emissions associated with the Project including the distance to sensitive receivers and proposed blast practices.</p> <p>Mitigated by private agreements with landholders, adaptive management, monitoring and consideration of blast size, product selection, weather conditions and sequencing/timing.</p>	4	D	21(L)
V059	Soil and Land Resource	Long-term geotechnical stability of final landforms.	<p>Considered the potential geotechnical issues associated with long-term geotechnical stability of the proposed post-mining landform.</p> <p>Mitigated through appropriate landform design according to the type of material (including co-disposed coal rejects), management and monitoring of rehabilitation and the development of a mine closure plan.</p>	5	C	22(L)
V067	Soil and Land Resource	Success/performance of rehabilitation post-mining.	<p>Considered potential failure of the rehabilitation. This could limit future land use options on the rehabilitated landforms and cause sediment release from the site.</p> <p>Mitigated through appropriate rehabilitation planning, implementation and monitoring against appropriate completion criteria prior to relinquishment.</p>	5	C	22(L)
V121	Soil and Land Resource	Suitable soil management and storage for future use in rehabilitation.	<p>Considered the potential for reduced soil quality following stripping and stockpiling and considered that adequate space would be available for appropriate stockpile design.</p> <p>Mitigated through appropriate soil management (e.g. best practice stockpile management) and incorporation of stockpile areas into the mine plan (to ensure sufficient space is available for stockpiles).</p>	5	C	22(L)

**Table 6 – Risk Ranking Results (Continued)**

Ref.	Environmental Issue Subject Area	Key Issue	Ranking Basis/Loss Scenario	C	P	R
V002	Soil and Land Resource	Impacts on agricultural resources disturbed as a result of mining activities.	<p>Considered the impacts on agricultural resources, including the Project rail spur. Noted the existing agricultural suitability and land capability of the Project area and the impacts to the region's agricultural productivity as a result of the Project.</p> <p>Mitigated through the appropriate management of soil and the potential to re-establish agricultural areas within the post-mining landform, and the socio-economic benefits of the mine and post-mining land use (i.e. restoration of agricultural areas).</p>	5	A	<b>15(M)</b>
V055	Soil and Land Resource	Development of long-term rehabilitation and mine closure concepts that balance land use and conservation objectives (final void management/acceptability).	<p>Considered the potential for rehabilitation to fail to create final landforms that support appropriate land use functions.</p> <p>Mitigated through including key rehabilitation and land use concepts in the EIS and progressive implementation of rehabilitation through the mine life, including development of quantitative rehabilitation criteria. Also considered the proven success of previous rehabilitation associated with historic mining on the site.</p>	4	D	<b>21(L)</b>
V074	Soil and Land Resource	Changes to the potential land uses directly disturbed or otherwise impacted as a result of mining activities.	<p>Considered the impacts of the Project on agricultural resources. Noted the existing agricultural suitability and land capability of the Project area and the impacts to the region's agricultural productivity as a result of the Project.</p> <p>Mitigated through the identification of final land uses according to proposed land form and planning for those uses. Also considered appropriate material handling (e.g. management of sodic soils).</p>	5	A	<b>15(M)</b>
V099	Surface Water	Insufficient site water flow / use monitoring data to enable model calibration which could cast doubt over predictions of water excess or shortfall.	<p>Considered the adequacy of the water balance calibration and the potential to cast doubt over predictions of water excess or shortfall.</p> <p>Mitigated by sufficient water licences held by Whitehaven (to make up any shortfall), ability to temporarily transfer water allocations between Whitehaven's operations, availability of harvestable rights, adequate sizing of storages (using the pit as a backup) and conservatism in modelling.</p>	4	E	<b>23(L)</b>
V091	Surface Water	Adverse impacts on downstream water quality parameters that could have consequential effects on ecology or beneficial use.	<p>Considered impacts associated with surface water runoff from mine landforms to the downstream environment and users.</p> <p>Mitigated through appropriate erosion and sediment control structures, mine water management system and minimisation of catchment areas.</p>	5	C	<b>22(L)</b>

**Table 6 – Risk Ranking Results (Continued)**

Ref.	Environmental Issue Subject Area	Key Issue	Ranking Basis/Loss Scenario	C	P	R
V124	Surface Water	Licensed extraction from the Namoi River.	Considered the potential impact of water extraction to downstream users. Mitigated by operating in accordance with licence conditions.	5	C	22(L)
V118	Surface Water	Mine water discharge in the event of extreme weather events.	Considered the potential downstream impacts associated with potential mine water discharge to the environment and other users. Mitigated by appropriate design/maintenance of erosion/sediment controls and sediment and mine water dams.	5	B	19(L)
V113	Surface Water	Seepage/runoff from mine disturbance areas bypassing water management systems and migrating off site with possible downstream contamination.	Considered the likely contaminants present in runoff from disturbed areas. Mitigated by an appropriately designed, suitably sized water management system and regular monitoring.	5	C	22 (L)
V096	Surface Water	Changes to flooding characteristics due to construction of the Project rail spur.	Considered the potential for the Project rail spur to exacerbate flooding impacts. Mitigated by the rail design in accordance with the requirements of the draft <i>Floodplain Management Plan for the Upper Namoi Valley Floodplain 2016</i> .	4	B	14(M)
V089	Visual	Visual impact of waste rock emplacements and mining infrastructure, including lighting.	Considered the impact of the Project on visual amenity in rural areas (including impacts from night-lighting). Mitigated through progressive rehabilitation of waste rock emplacements, appropriate placement of lighting plants, restriction on night-time operations on the external face of the waste rock emplacement and visual screening where required.	4	C	18(L)
V142	Heritage	Potential indirect impacts on the Kurrumbede homestead and other associated nearby heritage items.	Considered potential blasting vibration impacts on the Kurrumbede homestead. Mitigated by monitoring of blasting effects and potential for amendment of blast design to reduce vibration.	5	C	22(L)

R= Risk - Ranking basis 1 (highest risk) to 25 (lowest risk).

Risk rankings defined as 1 to 6 – High; 7 to 15 – Medium (or ALARP) and 16 to 25 – Low.



## **5 MONITOR AND REVIEW**

### **5.1 NOMINATED CO-ORDINATOR**

The nominated client review facilitator is Brian Cole - Executive General Manager, Project Delivery, Whitehaven.

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 Whitehaven management systems.

### **5.2 COMMUNICATION AND CONSULTATION**

Consultation, involvement of personnel (Whitehaven and their 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, and consideration of the report's outcomes in the overall Whitehaven management systems.

### **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 7.

Table 7 – Key Potential Environmental Issues to be Further Assessed in the EIS

Ref	Environmental Issue Subject Area	Summary Description of Issue	EIS Appendix/Section
V031, V039, V143	Noise and Blasting	Mine site and road transport noise emissions.	Appendix D and Section 4
V096, V091, V099, V113, V118, V124, V123	Surface Water	Impacts to Namoi River, changes to flooding characteristics, downstream water quality impacts and suitability of mine water management infrastructure.	Appendix B, Appendix C and Section 4
V025, V134	Groundwater	Groundwater drawdown, groundwater quality impacts.	Appendix A and Section 4
V089	Visual	Visual impact of waste rock emplacements and mining infrastructure, including lighting.	Appendix L and Section 4
V007, V005, V022	Biodiversity	Loss of biodiversity in the Gunnedah Basin, vegetation and habitat clearance and offset requirements.	Appendix F and Section 4
V059, V067, V074, V121, V002	Soil and Land Resource	Long-term geotechnical stability of final landform, rehabilitation success, soil management, impacts on agricultural resources.	Appendix H and Section 4
V055	Soil and Land Resource	Development of long-term rehabilitation and mine closure concepts that balance land use and conservation objectives (final void management/acceptability).	Section 5
V035	Air Quality	Potential effects of dust emissions on surrounding landowners.	Appendix E and Section 4
V142	Heritage	Potential indirect impacts on the Kurrumbede homestead and other associated nearby items.	Appendix K and Section 4

The risk rankings indicate that the loss scenarios ranked were within the “Medium - ALARP” or the “Low” range.

**OpRM** would like to thank all of the personnel who contributed to the risk assessment in particular those personnel from Whitehaven and Resource Strategies who prepared source material for the team session.

Peter Standish, April 2018

## 6 REFERENCES

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

Safe Production Solutions (2012) *Vickery Coal Project Environmental Risk Assessment*.

Whitehaven Coal Limited (2016) *Vickery Extension Project - Project Summary and Preliminary Environmental Assessment*. Ref - Project No. WHC-15-33. Document No. 00706292

## ATTACHMENT A – DEFINITIONS

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/NSZ ISO 31000:2009	Australian Standard/New Zealand Standard on Risk Management.
Cause	A source of harm.
Control	An intervention by the proponent intended to either Prevent a Cause from becoming an incident or to reduce the outcome should an incident occur.
CHPP	Abbreviation - Coal Handling and Preparation Plant
SEARs	Secretary’s Environmental Assessment Requirements.
ERA	Environmental Risk Assessment.
MDG1010	Department of Trade and Investment guideline on risk management (see references in Section 6).
OpRM	Abbreviation - Operational Risk Mentoring a trading name of Salbury Pty. Ltd.
Outcome	The end result following the occurrence of an incident. Outcomes are analogous to impacts and have a risk ranking attached to them.
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.
Review	An examination of the effectiveness, suitability and efficiency of a system and its components.
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.

## ATTACHMENT B – ISSUE IDENTIFICATION REGISTER

The output from the team’s analyses are presented below. This list was derived from the 2012 workshop outcomes with appropriate amendments and additions in 2016 for the Project.

Ref	Environmental Issue Subject Area	Description of Issue
V026	Aboriginal Cultural Heritage	Potential impact of the Project on Aboriginal heritage items.
V027	Aboriginal Cultural Heritage	Potential impact of the Project on Aboriginal heritage. With particular reference to the Grinding Grooves in the Namoi River and their potential exposure to blasting impacts.
V004	Air Quality	Air quality impacts associated with dust generation from land disturbance, blasting, excavation, hauling and handling of waste rock and ROM coal and greenhouse gas emissions.
V030	Air Quality	Cumulative dust impacts, particularly to the south as a consequence of cumulative operation with the Rocglen Coal Mine.
V032	Air Quality	Ensuring adequate and ongoing water supply for dust suppression.
V033	Air Quality	Increased greenhouse gas emissions.
V035	Air Quality	Potential effects of dust emissions on surrounding landowners.
V042	Air Quality	Potential for odorous emissions associated with coal self-heating (spontaneous combustion).
V115	Air Quality	Shortfall in water supply for dust suppression in dry times and consequent impacts on dust suppression/air quality.
V122	Air Quality	Greenhouse gases and associated impacts (positive use of larger fleet [lower diesel per tonne]).
V005	Biodiversity	Demonstrating the proposed offset is fit for purpose and in sufficient quantity.
V006	Biodiversity	Potential cumulative impacts from a number of mining projects on biodiversity values.
V007	Biodiversity	Cumulative impacts of multiple existing and proposed mine developments on regional biodiversity loss in the Gunnedah Basin.
V008	Biodiversity	<i>Environment Protection and Biodiversity Conservation Act, 1999</i> threatened vertebrate species or those species not located but with suitable habitat present in the Project area or the immediate surrounds.
V009	Biodiversity	Exceedance of gross ecosystem and geomorphic thresholds (in relation to water, Carbon, nutrient cycles and energy interception within the landscape [water movement and solar interception]).
V010	Biodiversity	Impacts on threatened fauna and ensuring offsets cater for threatened species.
V011	Biodiversity	Inability to communicate long term vision of the Project including benefits, costs and biodiversity-landform-rehabilitation-offset outcomes.
V013	Biodiversity	Loss of Endangered Ecological Communities (EECs), vegetation and fauna habitat and potential impact on listed threatened species, in particular, clearing of Winged Peppercress ( <i>Lepidium monoplacoides</i> ).
V014	Biodiversity	Loss of landscape connectivity restricting movement of fauna across the landscape.
V015	Biodiversity	New South Wales threatened vertebrate species present or those species not located but with suitable habitat present in the Project area or the immediate surrounds.
V016	Biodiversity	Potential cumulative loss of native vegetation on Permian landscapes in the Gunnedah Basin.
V017	Biodiversity	Retention of habitat components from cleared area for future use to upgrade or complement on site restoration programmes (future or existing) without significant pre-clearing planning.
V018	Biodiversity	Success of transplantation of Winged Peppercress and long-term management of transplanted specimens (associated with Approved Mine).
V019	Biodiversity	Impacts on groundwater dependent ecosystems as a result of groundwater drawdown.

Ref	Environmental Issue Subject Area	Description of Issue
V020	Biodiversity	Introduction of weeds and feral animals.
V021	Biodiversity	Potential impacts of vegetation disturbance associated with the Project.
V022	Biodiversity	Vegetation clearance related impacts on flora, fauna and their habitats (including EECs, threatened species and tree hollows).
V057	Biodiversity	Increase in weed species and feral vertebrate fauna.
V136	Fauna (Terrestrial and Aquatic)	Stream line restoration of aquatic species.
V139	Groundwater	Potential contamination of groundwater arising from tailings storages and seepage from them.
V023	Groundwater	Potential drawdown of groundwater levels and alteration of groundwater flow directions due to depressurisation associated with the development of the open cut and mine de-watering activities.
V024	Groundwater	Impacts on groundwater quality.
V025	Groundwater	Long-term changes to groundwater levels, flow direction and quality in the vicinity of the final void.
V100	Groundwater	Intersection of the alluvium at the southern end of pit and potential for failure of the highwall and consequential impacts of water flows in-pit and loss of water downstream.
V106	Groundwater	Potential impacts on aquifers and groundwater users - and the consequent effects of reduced groundwater flow to down gradient alluvium.
V107	Groundwater	Potential impacts on Upper Namoi Alluvium groundwater users.
V134	Groundwater	Seepage from the Western Emplacement to alluvial soils adjacent to the Canyon Coal Mine final void leading to potential groundwater and surface water quality impacts.
V142	Heritage	Potential indirect impacts on the Kurrumbede homestead and other associated nearby heritage items.
V028	Historic Heritage	Potential impact of the Project on historical heritage.
V056	Land Contamination	Risk of spill from final void.
V061	Land Contamination	Management of coal rejects.
V074	Land Contamination	Changes to the potential uses of land directly disturbed or otherwise impacted as a result of mining activities.
V093	Land Contamination	Segregation of top/sub soils and designation of areas to stockpile them.
V127	Land Contamination	Hydro-carbon spills from site storages/activities.
V130	Land Contamination	Bulk diesel storage at the mine infrastructure area.
V132	Land Contamination	Risks associated with sewage treatment works.
V143	Noise	Noise associated with Project rail movements on the Project rail spur.
V029	Noise and Blasting	Fume and dust impacts on neighbours.
V031	Noise and Blasting	Mine site noise emissions and potential effects on surrounding landholders.
V034	Noise and Blasting	Real time monitoring and ability to operate the Project within the relevant requirements.
V036	Noise and Blasting	Potential effects of noise emissions on surrounding landowners.
V037	Noise and Blasting	Potential fly rock impacts.
V039	Noise and Blasting	Ground vibration and airblast effects on amenity of nearby receivers and buildings.
V041	Noise and Blasting	Potential for increases in road noise, particularly during the construction phase.
V043	Noise and Blasting	Potential for vibration effects on nearby buildings.
V044	Noise and Blasting	Potential overpressure and ground vibration impacts due to blasting.
V045	Noise and Blasting	Noise impacts associated with the use of open cut mining equipment.
V070	Road Transport	Maintaining acceptable access to realigned public roads.
V082	Road Transport	Incremental increased travel distance for residents using Blue Vale Road (due to the proposed realignment).
V086	Road Transport	Potential impacts on public road network.

Ref	Environmental Issue Subject Area	Description of Issue
V120	Road Transport	Road realignment issues with cut and fill at south end of Vickery State Forest.
V126	Road Transport	Impact of trucking to Whitehaven CHPP prior to Project CHPP and Project rail spur reaching full operational capacity.
V137	Road Transport	Potential impact of Project rail spur on local roads around the site.
V138	Road Transport	Impact of coal being trucked from other Whitehaven mines to the Whitehaven CHPP on the local road network.
V144	Road Transport	Longer travel time for motorists associated with closure of Braymont Road.
V048	Socio-Economic	Bushfire risk to plant, equipment and personnel.
V050	Socio-Economic	Cumulative mining impacts in the overall area (Rocglen Coal Mine, Tarrawonga Coal Mine, Boggabri Coal Mine, Maules Creek Coal Mine).
V072	Socio-Economic	Perception that mine will devalue surrounding land.
V073	Socio-Economic	Socio-economic impact of the Project.
V081	Socio-Economic	Developing a community contribution plan that is fair and reasonable and achieves agreement with Councils.
V083	Socio-Economic	Potential social impacts in nearby towns due to cumulative effects of mining.
V084	Socio-Economic	Perception of surrounding landholders being devalued as a consequence of ongoing mining operations.
V088	Socio-Economic	Socio-economic benefits to the region and State.
V094	Socio-Economic	Availability of adequate water licences to account for predicted water allocation requirements, particularly in the latter stages of the Project.
V102	Socio-Economic	Potential cumulative impacts on downstream surface water users.
V129	Socio-Economic	Risks associated with explosives storage on site.
V131	Socio-Economic	Segregation of Travelling Stock Route with the construction of the road realignment.
V141	Socio-Economic	Impacts on neighbouring communities / towns due to the inflow of workers during the construction phase and operating phase of the project.
V001	Soil and Land Resource	Potential for loss of land capability.
V002	Soil and Land Resource	Impacts on agricultural resources disturbed as a result of mining activities.
V003	Soil and Land Resource	Potential impacts on forestry resources (i.e. Vickery State Forest).
V047	Soil and Land Resource	Combined risk from aggregation of mine sites in the area.
V051	Soil and Land Resource	Acceptability of final voids (in the post mining landform).
V052	Soil and Land Resource	Visual implications of rehabilitation success.
V054	Soil and Land Resource	Achieving appropriate design of final landform so that it integrates with the surrounding natural topography.
V055	Soil and Land Resource	Development of long-term rehabilitation and mine closure concepts that balance land use and conservation objectives (final void management/acceptability).
V059	Soil and Land Resource	Long-term geotechnical stability of final landforms.
V062	Soil and Land Resource	Mine closure and long-term land use, including final void management.
V063	Soil and Land Resource	Rehabilitation failure due to deficient soil nutrients or seasonal impacts.
V064	Soil and Land Resource	Rehabilitation failures due to drought.
V067	Soil and Land Resource	Success/performance of rehabilitation post-mining.
V121	Soil and Land Resource	Suitable soil management and storage for future use in rehabilitation.
V128	Soil and Land Resource	Cumulative impacts around Mining Lease 1464.
V133	Soil and Land Resource	Restoration of agricultural values - pasture.
V135	Soil and Land Resource	Suitable controls for soil management and storage.
V162	Soil and Land Resource	Potential for fragmentation of existing agricultural land uses, particularly associated with the Project rail spur.
V060	Surface Water	Long-term success/performance of the up-catchment diversion.

Ref	Environmental Issue Subject Area	Description of Issue
V065	Surface Water	Final void and associated water management to minimise adverse surface water and groundwater quality impacts, including seepage from final landform to final void increasing inflow to final void and reducing flow to receiving waters.
V066	Surface Water	Stability of final landform (erosion) and maintenance of stable drainage paths.
V075	Surface Water	Sufficient water available for dust suppression or are surfactants required.
V076	Surface Water	Changes to catchment areas and flow characteristics due to the construction of mine water dams, waste rock emplacements and the final void.
V077	Surface Water	Increased potential for erosion and sedimentation due to the increased area of land disturbance.
V078	Surface Water	Potential extraction and/or discharge of water as part of the on-site water management system.
V091	Surface Water	Adverse impacts on downstream water quality parameters that could have consequent effects on ecology or beneficial use.
V091A	Surface Water	Drainage from emplacements will drain to the north and west - ultimately ending up in Barbers Lagoon.
V092	Surface Water	Inundation of pit during operations.
V096	Surface Water	Changes to flooding characteristics due to construction of the Project rail spur.
V097	Surface Water	Flooding risk of proposed mine infrastructure area from flood flows in Stratford and South Creeks.
V098	Surface Water	Inability to comply with Environment Protection Licence water quality limits in sediment dam discharge.
V099	Surface Water	Insufficient site water flow/use monitoring data to enable model calibration which could cast doubt over predictions of water excess or shortfall.
V103	Surface Water	Potential for generation of erosion during construction and stripping activities.
V104	Surface Water	Potential for inadequate water supply on site for operational purposes - particularly if additional water application is necessary to reduce dust impacts.
V105	Surface Water	Potential impact of loss of water downstream from the Project site as a consequence of the up-catchment diversion (perception by landholders that creek flows underground and diversion may well risk the continued flow of water to their holdings).
V108	Surface Water	Redirection of surface flow due to the up-catchment diversion.
V109	Surface Water	Reduction in creek flows downstream of mine due to catchment excision during and post-mining.
V110	Surface Water	Risk of excess water (due to increased surface area of disturbance) and increased need to discharge via Licensed Discharge Points.
V112	Surface Water	Risk of erosion along the up-catchment diversion.
V113	Surface Water	Seepage/runoff from mine disturbance areas bypassing water management system and migrating off-site with possible downstream contamination.
V114	Surface Water	Seepage from up-catchment areas seeping through waste emplacement and either contributing to mine water balance or causing further poor quality seepage off-site.
V116	Surface Water	Site access for personnel, fuel and coal transport - local flooding (South Creek) and major floods (Namoi River).
V117	Surface Water	Stability of the up-catchment diversion both in short-term and long-term (post-mining).
V118	Surface Water	Mine water discharge in the event of extreme weather events.
V119	Surface Water	Pit water containment.
V123	Surface Water	Increased leakage of, or reduced base flow to, the Namoi River due to depressurisation of aquifers.
V124	Surface Water	Licensed extraction of water from the Namoi River.
V162	Surface Water	Review issues related to flood protection of the voids during operation and for final void (flood protection bunds) at mine closure.
V163	Surface Water	Risk of flooding of mine pit(s) from Namoi River or Stratford Creek



<b>Ref</b>	<b>Environmental Issue Subject Area</b>	<b>Description of Issue</b>
V068	Visual	Waste rock management particularly in areas of rock with elevated elements.
V079	Visual	Modification of the existing views from sensitive receptors of the Development Application area due to the development of the open cut and waste rock emplacements.
V080	Visual	Use of night-lighting for the Project.
V085	Visual	Potential for increased visual impacts, particularly for residential receivers.
V089	Visual	Visual impact of waste rock emplacements and mining infrastructure, including lighting.
V090	Visual	Visual impacts from lighting from the Project site, particularly from elevated dump heights, and safety impacts to road users on Kamilaroi Highway.
V161	Visual	Opportunity to improve Biodiversity outcomes with the provision of vegetative corridor(s) in the rehabilitated site.

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