

Appendix 6

Assessment of Environmental Risk

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A6.1 INTRODUCTION

Risk is the chance of something happening that will have an impact upon the objectives or the task which, in this case, is the safe and environmentally responsible construction and operation of the amended Project. As discussed in Section 3.3.1, the Applicant convened a workshop in 2012 to broadly identify and rank the full range of environmental risks for the 2013 Project. Following the amendment of the 2013 Project, the outcomes of the risk assessment have been reviewed by the Applicant, RWC and relevant Specialist Consultants. The outcomes of the risk assessment incorporates the adoption of standard, industry-wide controls and mitigation measures.

The allocation of a qualitative consequence ranking was based on the definitions defined within the risk assessment workshop's environmental risk matrix as displayed under the following headings, with the qualitative likelihood or probability ranking of the impact(s) occurring for each risk source defined within **Table A6.1**. The risk ranking was then established based upon the matrix presented in **Table A6.2**.

The five qualitative environmental consequence risk rankings adopted by the participants at the risk workshop and in the subsequent review undertaken for the amended Project are defined below. It should be noted that whilst an "insignificant" category has been included within the qualitative consequence ranking definitions, no risk rankings have been deemed as "insignificant" as, since they pose a negligible environmental impact, they were not considered within the broad-brush risk assessment.

- Critical (C): The potential to cause regional environmental impact/ecosystem damage with impacts causing mine or business closure, e.g. major off-site release of a contaminant with long-term detrimental effects.
- High (H): The potential to cause substantial regional/local environmental damage which could result in major financial loss and/or prosecution, e.g. off-site release of a contaminant resulting in local ecosystem damage.
- Medium (M): The potential to cause substantial temporary or minor long-term damage, e.g. a minor water or large hydrocarbon off-site release with outside clean-up assistance required. May potentially result in a legal non-compliance.
- Low (L): The potential for a temporary or minor spill. No legal breach but may be non-compliant with internal environmental target, e.g. minor hydrocarbon spill.
- Insignificant (I): No detrimental effect, negligible environmental impact.

Table A6.1
Qualitative Likelihood Ranking

Level	Descriptor	Description
A	Almost Certain	Is expected to occur in most circumstances.
B	Likely	Will probably occur in most circumstances.
C	Possible	Could occur.
D	Unlikely	Could occur but not expected.
E	Rare	Occurs only in exceptional circumstances.

Source: HB 203:2006 - Table 4(A)

Table A6.2
Risk Rankings

		Likelihood				
Consequence		A - Certain	B - Likely	C - Possible	D – Unlikely	E - Rare
	1 – Critical	1	2	4	7	11
	2 – High	3	5	8	12	16
	3 – Medium	6	9	13	17	20
	4 – Low	10	14	18	21	23
	5 – Insignificant	15	19	22	24	25

Note: Ranking modified after HB 203:2006 - Table 4(C)

Table A6.3 presents the identified risk sources, the potential consequences, components of the environment or receivers of the identified risk and the risk rankings assuming standard controls together with the location of the proposed management and control measures identified within Section 4 of the EIS. In a number of cases, the standard controls would be appropriate to achieve an acceptable level of impact whereas for some cases, additional project or site-specific controls are required to achieve the required level of impact. The risk rankings have been determined from **Table A6.2** and colour-coded on **Table A6.3**.



**Table A6.3
Analysis of Environmental Risks**

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.
ENVIRONMENTAL ISSUE – NOISE			
Noise emissions from site establishment and construction activities.	Amenity impacts on residential and other sensitive receivers.	6 (A3)	4.2.5
Noise emissions from mining operations.	Amenity impacts on residential and other sensitive receivers.	13 (C3)	4.2.5
Noise emissions from site establishment and construction activities.	Health impacts on residential and other sensitive receivers.	17 (D3)	4.2.5
Noise emissions from mining operations.	Health impacts on residential and other sensitive receivers.	21 (D4)	4.2.5
Noise generated during transportation of sized coal from the Mine Area to the Stratford Mining Complex.	Amenity impacts on residential and other sensitive receivers.	21 (D4)	4.2.5
ENVIRONMENTAL ISSUE – BLASTING			
Ground vibration and airblast from blasting activities.	Amenity impacts on residential and other sensitive receivers.	18 (C4)	4.3.4
Rock propelled outside the designed blast envelope (i.e. flyrock) causing property damage.	Flyrock ejected outside blast envelope resulting in damage to nearby residences / surrounding property / infrastructure / stock.	13 (C3)	4.3.4
Rock propelled outside the designed blast envelope (i.e. flyrock) causing injury and/or death.	Flyrock ejected outside blast envelope resulting in injury or death	16 (E2)	4.3.4
Flyrock and airblast from blasting.	Flyrock and airblast impacting upon airborne aircraft and aerial operations.	16 (E2)	4.3.4
ENVIRONMENTAL ISSUE – AIR QUALITY			
Generation of blasting fume.	Amenity impacts on residents and other sensitive receivers.	17 (D3)	4.4.7.4
Generation of blasting fume.	Health impacts on residential and other sensitive receivers.	17 (D3)	4.4.7.4
Dust emissions from project depositing on roofs used for rainwater collection.	Community concern regarding dust collection in drinking water tanks and rain water collection storages.	17 (D3)	4.4.7.2, 4.4.7.3
Odour from spontaneous combustion of coal.	Amenity impacts on residential and other sensitive receivers.	17 (D3)	4.4.7.5
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**Table A6.3 (Cont'd)
Analysis of Environmental Risks**

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.
ENVIRONMENTAL ISSUE – AIR QUALITY (Cont'd)			
Emissions of TSP/PM10/PM2.5/Deposited dust from construction activities.	Health and / or amenity impacts on residential and other sensitive receivers.	18 (C4)	4.4.7
Emissions of TSP/PM ₁₀ /PM _{2.5} / Dust from mining, processing (coal breaker), stockpiling and loading operations.	Health and / or amenity impacts on residential and other sensitive receivers.	18 (C4)	4.4.7
Deposited dust impacting agricultural productivity.	Unacceptable dust load on crops on surrounding agricultural land.	21 (D4)	4.4.7
Emissions of TSP/PM ₁₀ /PM _{2.5} / Deposited dust from truck haulage operations.	Health and / or amenity impacts on residential and other sensitive receivers.	24 (D5)	4.4.7
Scope 1 (on site), Scope 2 (off site generation) and Scope 3 (off site impacts associated with coal life cycle) GHG Emissions.	Climate change impact from the Project, locally, regionally, and worldwide.	24 (D5)	4.4.7.6
ENVIRONMENTAL ISSUE – VISIBILITY			
Construction of western and northern amenity barrier.	Amenity impacts through change in content and composition of views from residences and public vantage points.	5 (B2)	4.5.4
Operations within the open cut pits, waste rock emplacement (after completion of the western and northern amenity barriers).	Amenity impacts through change in content and composition of views from residences and public vantage points.	18 (C4)	4.5.4
Lighting or lighting glow during evening operations.	Visual intrusion or reduction in scenic quality at residential and other sensitive receivers.	14 (B4)	4.5.4.4
Off-site activities.	Local amenity impact of visibility of vehicles travelling to and from the Mine Area, maintenance activities on residential and other sensitive receivers.	18 (C4)	4.5.4

Low	Medium	High	Critical
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Table A6.3 (Cont'd)
Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.
ENVIRONMENTAL ISSUE – GROUNDWATER			
Interception of alluvial groundwater in open cut pits (via coal seams, geological structure, etc.).	Reduction in baseflow in the Avon River / Waukivory Creek inflows between pits and alluvium and vice versa impacting on stream flow.	14 (B4)	4.6.6
Interception of alluvial groundwater in open cut pits (via alluvium, coal seams, geological structure, etc.).	Impact on groundwater (alluvial) biota, e.g. stygofauna.	18 (C4)	4.6.6
Modified groundwater quality / quantity due to waste rock / breaker reject emplacement.	Discharge of poor quality groundwater / surface water from the post closure landform impacting on downstream water uses.	17 (D3)	4.6.6
Permian groundwater inflows to pits.	Reduced water quantities within groundwater systems (irrespective of saline quality).	6 (A3)	4.6.6
Permian groundwater inflows to pits.	Reduced water quality within groundwater systems.	17(D3)	4.6.6
Interruption of flow from groundwater systems into surface waters.	Noticeable reduction in base flow regimes in the Avon River and/or Waukivory Creek, with impacts on downstream aquatic ecology and other users and concerns regarding alluvial groundwater systems.	18 (C4)	4.6.6
ENVIRONMENTAL ISSUE – SURFACE WATER			
Runoff from rainfall event causes water release.	Discharge of sediment-laden water into the Avon River and Waukivory and Oaky Creeks catchments impacting upon the riverine ecology and downstream users.	13 (C3)	4.7.4
Inflows of saline water into alluvial groundwater system.	Pollution of alluvial water and potentially the Avon River and Waukivory and Oaky Creeks catchments.	13 (C3)	4.7.4
Dam failure.	Rapid discharge of saline / sediment-laden water into the Avon River and Waukivory and Oaky Creeks catchments leading to loss of life and damage to infrastructure.	17 (D3)	4.7.4
Water requires chemical or additional treatment before discharge.	Retention of excess poor quality water due to inability to discharge to surface water and groundwater systems without additional treatment.	13 (C3)	4.7.4
Chemical contamination of surface water from mining activities.	Impact on surface or groundwater biota within the Avon River and Waukivory and Oaky Creeks surface water catchments and alluvial groundwater systems.	21 (D4)	4.7.4
Erosion of upstream diversion channels.	Diversion erosion / instability on Waukivory Creek/Oaky Creek surface water catchments leading to increased sediment loads.	13 (C3)	4.7.4
Redirection of flows into adjacent streams.	Erosion of Waukivory Creek and/or Oaky Creek Channels and surface water catchments leading to increased sediment loads.	18 (C4)	4.7.4
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**Table A6.3 (Cont'd)
Analysis of Environmental Risks**

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.
ENVIRONMENTAL ISSUE – SURFACE WATER (Cont'd)			
Earthworks on margin of floodplain.	Loss of flood storage and increased adjacent flood levels, impacting infrastructure and cropping on the Avon River and Waukivory Creek floodplains.	24 (D5)	4.7.4
Salinity budget.	Long-term increase in salinity levels in regional surface and groundwater due to mining impacting the Avon River and Waukivory Creek floodplains.	21 (D4)	4.7.4
ENVIRONMENTAL ISSUE – SOILS			
Inappropriate soil management.	Inadequate soil available for rehabilitation purposes for the Mine Area and private haul road corridor leading to less successful rehabilitation and increased rehabilitation costs and maintenance to the Mine Area and private haul road corridor.	17 (D3)	4.8.4
Inappropriate soil management.	Degradation of soil in stockpiles leading to less successful rehabilitation and increased rehabilitation costs and maintenance to the Mine Area.	17 (D3)	4.8.4
Inappropriate soil management.	Erosion of soil stockpiles within the Waukivory Creek / Oaky Creek catchment areas leading to increased sediment loads in both creeks.	22 (C5)	4.8.4
ENVIRONMENTAL ISSUE – TRAFFIC			
Increased traffic through Fairbairns Road (uncontrolled) rail crossing.	Train/vehicle accidents on local road network users.	7 (D1)	4.9.3
Increased traffic through Jacks Road (controlled) rail crossing.	Impact on train/vehicle accidents impacts on local road network users.	11 (E1)	4.9.3
Existing road design unsuited to planned use / traffic levels.	Damage to existing infrastructure resulting in community complaints and impact on the local road network.	13 (C3)	4.9.3
Existing bridges unsuited to planned use / traffic levels.	Damage to existing infrastructure resulting in community complaints and impact on local road network.	13 (C3)	4.9.3
Increased traffic on local and regional roads.	Increase incidents/accidents due to project traffic along local and regional road networks.	12 (D2)	4.9.3
Increased traffic on local and regional roads.	Accelerated pavement deterioration due to use by vehicles travelling to and from the Mine Area requiring repair along local and regional road networks.	18 (C4)	4.9.3
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Analysis of Environmental Risks

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.
ENVIRONMENTAL ISSUE – ABORIGINAL CULTURAL HERITAGE			
Unauthorised destruction of known sites.	Loss of heritage values.	17 (D3)	4.10.9
Unauthorised destruction of unknown sites within approval areas.	Loss of heritage values.	17 (D3)	4.10.9
ENVIRONMENTAL ISSUE – HISTORIC HERITAGE			
Mining operations.	Impact to scenic historic heritage within the Gloucester LGA, with landscape changing from rural to industrial.	20 (E3)	4.11.4
ENVIRONMENTAL ISSUE – TERRESTRIAL ECOLOGY			
Planned clearing of vegetation communities.	Loss of habitat for terrestrial fauna species, loss of threatened or rare native vegetation or vegetation communities and biodiversity values.	17 (D3)	4.12.4
Planned clearing of vegetation.	Injuries to native fauna during clearing / earthworks (pre-strip).	18 (C4)	4.12.4
Changes to groundwater and surface water systems.	Adverse impacts on groundwater dependent ecosystems.	17 (D3)	4.12.4
Mining operations.	Indirect impacts to fauna communities due to light / noise / blasting etc.	18 (C4)	4.12.4
ENVIRONMENTAL ISSUE – AQUATIC ECOLOGY			
Mining operations.	Chemical contamination of groundwater leading to toxic effects on groundwater biota and waters of the Avon River and Waukivory and Oaky Creeks.	21 (D4)	4.13.5
Modified groundwater quality / quantity post mine closure.	Impact of groundwater biota, aquatic ecological biodiversity, stygofauna and biota of surface waters of the Avon River and Waukivory and Oaky Creeks.	21 (D4)	4.13.5
Discharge of water into the Avon River and Waukivory Creek – changes to flow.	Changes to geomorphology and flow regimes of receiving waters and impacts to aquatic ecology, riparian and GDE assemblages	21 (D4)	4.13.5
Discharge water in the Avon River and Waukivory Creek – changes to water quality (especially electrical conductivity (EC)).	Changes to the chemical nature of receiving waters, impacting aquatic ecology and riparian and GDE assemblages.	21 (D4)	4.13.5
Abstraction and redirection of water (from local creeks) for use at Site.	Changes to geomorphology and flow regimes of creeks / rivers impacting aquatic ecology and riparian and GDE assemblages.	21 (D4)	4.13.5
Impacts of watercourse crossings– construction impacts.	Damage to the Avon River and/or Waukivory Creek due to necessary upgrade / replacement of watercourse crossings.	18 (C4)	4.13.5
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**Table A6.3 (Cont'd)
Analysis of Environmental Risks**

Risk Source	Consequence / Hazard	Risk with Standard Control Measures	Proposed Control Measures EIS Section Ref.
ENVIRONMENTAL ISSUE – BUSH FIRE			
Fire initiated off site.	Fire initiated off site threatening Site operations, impacting on-site stock and infrastructure.	12 (D2)	4.14.6
Fire initiated on site.	Fire initiated on site threatening Site operations or spreading off site and impacting on stock and infrastructure.	17 (D3)	4.14.6
ENVIRONMENTAL ISSUE – SOCIO-ECONOMIC			
Mining operations.	Localised impacts on land values and housing market leading to devaluation.	9 (B3)	4.17.5
Mining operations	Localised impacts of land values and housing markets leading to rent increases.	13 (C3)	4.17.5
Mining operations.	Perception of negative health impacts on the community within the surrounding residences / Gloucester LGA.	9 (B3)	4.17.5
Mining operations.	Equity imbalance in wages / access to resources between miners and other sectors within the Gloucester LGA / Hunter region.	14 (B4)	4.17.5
Mining operations.	Community division between support and opposition for the Project within the surrounding community.	14 (B4)	4.17.5
Mining operations.	Inability of local business to compete with mining wages leading to antagonism towards the amended Project from local businesses.	18 (C4)	4.17.5
Population increase associated with employment growth.	Stress on the local services leading to community disharmony and poor relationships with the Applicant.	18 (C4)	4.17.5
Mining operations.	Cumulative social impacts within the Gloucester LGA.	18 (C4)	4.17.5
Mining operations.	Mining operations lead to negative impacts on tourism and agriculture within the Gloucester LGA.	21 (D4)	4.17.5

 Low	 Medium	 High	 Critical
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