BHP Mitsubishi Alliance

Appendix E2

Groundwater Dependent Ecosystem Risk Assessment

Table A.1: Risk assessment matrix

Qualitative measure of likelihood (how likely is it that this event/circumstance will occur after management activities are implemented)	
Highly likely	Is expected to occur in most circumstances
Likely	Will probably occur during the Project
Possible	Might occur during the Project
Unlikely	Could occur but is considered unlikely or doubtful
Rare	May occur in exceptional circumstances

Qualitative measure of consequences (what will be the consequence/result if the event does occur)	
Minor	No impact identifiable above baseline ecological conditions
Moderate	Plant stress linked to mining activity that results in the reduction in volume and duration of groundwater supporting a GDE system that does not result in more than 5% dieback of 'mature canopy trees'*. Impact localised and reversible with mitigation.
High	Plant stress linked to mining activity that results in the reduction in volume and duration of groundwater supporting a GDE system that does not result in more than 25% dieback of mature canopy trees (defined as a canopy tree with DBH >60cm). Impact is reversible with mitigation.
Major	Significant harm (loss of 25 to 50% of mature canopy trees). Impact is reversible although a significant lag in return to pre-disturbance condition occurs (lag>20yrs). Vegetation is converted from remnant to non-remnant status and significant impacts to habitat for protected fauna species occurs. Biodiversity offsets may be required.
Critical	Irreversible impact to > 50% 'mature canopy trees'* that cannot be mitigated. Vegetation is converted from remnant to non-remnant status and significant impacts to habitat for protected fauna species occurs. Biodiversity offsets will be required.

		Consequence				
		Minor	Moderate	High	Major	Critical
Likelihood	Highly likely	Low	Medium	High	Severe	Severe
	Likely	Low	Medium	High	High	Severe
	Possible	Low	Medium	Medium	High	Severe
	Unlikely	Low	Low	Medium	Medium	High
	Rare	Low	Low	Low	Low	Medium

Table A.2: Formal risk assessment

Impact and risk description	Initial risk rating			Mitigation measures	Residual risk rating		
	Likelihood	Consequence	Result		Likelihood	Consequence	Result
Groundwater drawdown	Possible	High	Medium	• Ongoing monitoring of terrestrial GDEs will be undertaken as part of a GDEMMP and with adaptive management this will assist in identifying potential indirect impacts to terrestrial GDEs resulting from the Project and trigger appropriate corrective actions. This includes baseline characterisation of vegetation condition of the likely terrestrial GDEs prior to any predicted impacts. • Annual monitoring of groundwater will be implemented to identify trends and changes over time.	Possible	Minor	Low
Reduced groundwater quality	Likely	High	High	• Annual monitoring of groundwater quality will be implemented to identify trends and changes over time. • Sediment dams, pit water storage and other water management structures (e.g. bunds and drains) will be designed and operated in accordance with BMA's standards and within the current framework specified in the existing CVM Water Management Plan. • Bunding and appropriate storage of fuels and other hazardous and flammable materials will be undertaken in accordance with AS1940:2004, and where practical, will be located away from any waterbodies. • The Project's water management will be based on the separation and management of clean and mine affected water catchments • The current REMP and associated water quality monitoring program will be continued. The program is designed to ensure the MWMP is effective, to demonstrate compliance with the Mine's strict discharge limits, and to ensure the downstream water quality (physico-chemical parameters, at a minimum) is not being adversely impacted. • Oil spill recovery equipment will be available when working adjacent to drainage channels with the ability to discharge off site. Spill kits will be located with construction crews conducting	Unlikely	Moderate	Low

Impact and risk description	Initial risk rating			Mitigation measures	Residual risk rating		
	Likelihood	Consequence	Result		Likelihood	Consequence	Result
				activities with the potential for significant spills. CVM existing SOP for spill management will be utilised. • Ongoing monitoring of terrestrial GDEs will be undertaken as part of a GDEMMP and with adaptive management this will assist in identifying potential indirect impacts to terrestrial GDEs resulting from the Project and trigger appropriate corrective actions. This includes baseline characterisation of vegetation condition of the likely terrestrial GDEs prior to any predicted impacts.			
Reduced surface water quality through erosion and sedimentation	Likely	High	High	• Appropriate erosion and sediment control measures will be established as required to reduce the amount of runoff from disturbed areas in accordance with industry standards and guidelines. • Construction of the haul road crossing will occur over the dry season to minimise soil disturbance on adjacent waterways. • As soon as practical, disturbed areas will be rehabilitated to reduce the amount of exposed soils. • Sediment dams, pit water storage and other water management structures (e.g. bunds and drains) will be designed and operated in accordance with BMA's standards and within the current framework specified in the existing site MWMP. • Disturbed areas within the Project site will be diverted to sediment dams for treatment, and possible reuse for dust suppression and process water requirements. This will maximise their storage capacity to reduce the risk of off-site discharges. • The road crossing of the Horse Creek will be managed in accordance with the measures outlined for construction and operations.	Unlikely	Moderate	Low
Reduced quality of surface water	Likely	High	High	• Appropriate erosion and sediment control measures will be established as required to reduce the amount of runoff from disturbed areas in accordance with industry standards and guidelines.	Unlikely	Moderate	Low

Impact and risk description	Initial risk rating			Mitigation measures	Residual risk rating		
	Likelihood	Consequence	Result		Likelihood	Consequence	Result
				• Bunding and appropriate storage of fuels and other hazardous and flammable materials will be undertaken in accordance with AS1940:2004, and where practical, will be located away from any waterbodies. • Sediment dams, pit water storage and other water management structures (e.g. bunds and drains) will be designed and operated in accordance with BMA's standards and within the current framework specified in the existing Mine Water Management Plan. • The Project's water management will be based on the separation and management of clean and mine affected water catchments. • Disturbed areas within the Project site will be diverted to sediment dams for treatment, and possible reuse for dust suppression and process water requirements. This will maximise the storage capacity to reduce the risk of off-site discharges. • The current REMP and associated water quality monitoring program will be continued. The program is designed to ensure the MWMP is effective, to demonstrate compliance with the Mine's strict discharge limits, and to ensure the downstream water quality (physico-chemical parameters, at a minimum) is not being adversely impacted. • Fuel, dangerous goods and hazardous chemicals will be managed as outlined by current standards, guidelines and in compliance with statutory requirements. • The existing SOP for spills and emergency response procedures will continue to be utilised. Spill recovery and containment equipment will be available when working adjacent to sensitive drainage paths and within other areas, such as workshops. • Water Quality monitoring will be conducted as part of the Project's EA conditions and in accordance with the REMP.			
Direct clearing of terrestrial GDE	Unlikely	Critical	High	• No potential terrestrial GDEs will require clearing as a result of the Project. Terrestrial GDEs are located outside of the Disturbance Footprint.	Rare	Major	Low

Impact and risk description	Initial risk rating			Mitigation measures	Residual risk rating		
	Likelihood	Consequence	Result		Likelihood	Consequence	Result
				• The existing Caval Ridge Mine infrastructure will be utilised where possible to minimise the need for additional disturbance. • Ongoing monitoring of terrestrial GDEs will be undertaken as part of a GDEMMP and with adaptive management this will assist in identifying potential indirect impacts to terrestrial GDEs resulting from the Project and trigger appropriate corrective actions.			
Changes to hydrological flows affecting groundwater recharge	Possible	High	Medium	• Existing hydrological function of watercourses will be maintained, allowing recharge of associated aquifers. • The current REMP and associated water quality monitoring program will be continued. The program is designed to ensure the MWMP is effective, to demonstrate compliance with the Mine's strict discharge limits, and to ensure the downstream water quality (physico-chemical parameters, at a minimum) is not being adversely impacted. • Ongoing monitoring of terrestrial GDEs will be undertaken as part of a GDEMMP and with adaptive management this will assist in identifying potential indirect impacts to terrestrial GDEs resulting from the Project and trigger appropriate corrective actions. This includes baseline characterisation of vegetation condition of the likely terrestrial GDEs prior to any predicted impacts.	Unlikely	Moderate	Low
Cumulative impacts from mining and climatic extremes, e.g. drought	Possible	Major	High	• Ongoing monitoring of terrestrial GDEs will be undertaken as part of a GDEMMP and with adaptive management this will assist in identifying potential indirect impacts to terrestrial GDEs resulting from the Project and trigger appropriate corrective actions. This includes baseline characterisation of vegetation condition of the likely terrestrial GDEs prior to any predicted impacts. • On-going monitoring of groundwater levels and quality will be undertaken.	Unlikely	Moderate	Low