

Risk Type (T=Threat) Category Subcategory Item	Ref.	Risk Description				Control Effectiveness	Risk Evaluation			Risk Rating		Count				Final Risk Rating	Management Effectiveness					
							Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment			Compliance				
		Causes (Triggers / Indicators)	Impacts (Consequences)	Controls																		
T A		In Pit and Out pit waste																				
T A	01	Safe																				
T A	01 01	Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to subsoil/topsoil characteristics/availability, inadequate surface preparation, poor early germination, localised settlement, rock used for erosion control	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), monitoring, maintenance controls (pre-closure), risk assess controls when designed and placed and modify as required, post-closure monitoring.	C2	P		L		II		0	0	1	0	II					
T A	01 02	Slope steepness in excess of that expected for the PMLU	Inappropriate landform design, landform design restrictions	Safety hazard for personnel, stock and wildlife	Landform design criteria appropriate to PMLU, operational slope controls	C1	U		L		I		0	0	0	1	I					
T A	02	Stable - geotechnical risk																				
T A	02 01	Significant slope failure	Excessive slope steepness, physical material properties, poor drainage, adverse rainfall event	Localised land impacts and downstream water quality impacts	Geotechnical analysis undertaken where appropriate, slope moderation, adequate drainage design constructed, rapid revegetation	C2	U		M	M		II II	0	0	2	0	II					
T A	03	Stable - erosional risk																				
T A	03 01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Soil sampling and analysis prior to rehabilitation. Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring and management as required, sediment controls during establishment.	C2	U			M		II	0	0	1	0	II					
T A	03 02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, subcatchment delineation, sufficient water storage structures, engineered flow channels, effective revegetation techniques, rehabilitation monitoring and management as required	C2	U			M		II	0	0	1	0	II					
T A	03 03	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Existing rehabilitation of waste emplacements, downstream sedimentation controls, prompt revegetation, monitoring of drainage performance, maintenance and remediation as required.	C2	U			M		II	0	0	1	0	II					
T A	03 04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Rehabilitation failure/ vegetation disease/loss, climatic events, other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring, management and remediation as required.	C2	U			M		II	0	0	1	0	II					

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							Likelihood - Frequency	Likelihood - Probability	Health		Environment Compliance		Health		Environment Compliance					
T A 04		Non-polluting - geochemical risk																		
T A 04 01		Acid and saline drainage generation	Causes (Triggers / Indicators) Adverse waste rock geochemistry	Impacts (Consequences) Revegetation performance impacts, water quality in pit lake and downstream receiving environment, and dependent ecosystem impacts, groundwater impacts (incl.GDEs)	Controls Out of pit waste emplacement to be constructed to design specifications as prepared by an AQP. Negative NAPP waste rock materials, low propensity for saline drainage. Coal rejects to be encapsulated deep within waste emplacements. Routine confirmatory geochemical testing. Regular monitoring and assessment of runoff and pit lake water quality.	C2	P			L		II		0	0	1	0	II		
T A 05		Non-polluting - other environmental harm																		
T A 05 01		Not applicable												0	0	0	0			
T A 06		Sustainable - PMLU																		
T A 06 01		Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density metrics, and shortage of topsoil resources	Insufficient pasture productivity	Improving rehabilitation methodologies, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C1	U			L		I		0	0	0	1	I		
T A 06 02		Insufficient topsoil resources onsite available to undertake rehabilitation activities	Poor management practices, shortage of topsoil resources	Poor vegetation establishment, insufficient habitat suitable for native fauna, insufficient pasture productivity	Adequate topsoil stockpiling and management strategies, annual review of topsoil inventory	C2	U			M		II		0	0	1	0	II		
T A 06 03		Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate.	C1	U			L		I		0	0	0	1	I		
T B		Temporary waste emplacement																		
T B 01		Safe																		
T B 01 01		Surface roughness (rockiness and depressions) in excess of that expected for the PMLU	Erosion gullies etc due to some dispersive subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), maintenance controls (pre-closure), rehabilitation monitoring and assessment, undertake repairs and maintenance as required	C2	P			L		II		0	0	1	0	II		
T B 01 02		Slope steepness in excess of that expected for the PMLU	Landform not constructed to design	Safety hazard for personnel, stock and wildlife	Dump and slope survey controls, reshaping to design	C1	U			L		I		0	0	0	1	I		

Ref.	Risk Description				Control Effectiveness	Risk Evaluation				Risk Rating		Count				Final Risk Rating	Management Effectiveness					
						Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance							
T	B	02			Stable - geotechnical risk																	
T	B	02	01		Significant slope failure	Landform not constructed to design, excessive slope steepness, physical material properties, inadequate drainage controls, adverse rainfall event	Localised land impacts and downstream water quality impacts	Slope moderation, maximum slopes subject to engineered design by geotechnical analysis, provision of adequate drainage infrastructure, rapid revegetation, rehabilitation monitoring and assessment, undertake repairs and maintenance as required	C2	U		M	M		II	II	0	0	2	0	II	
T	B	03			Stable - erosional risk																	
T	B	03	01		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, sediment controls during vegetation establishment, revegetation monitoring, revegetation maintenance and repairs as required, modify revegetation methods and techniques and other contributing factors to improve the likelihood of revegetation success on rehabilitated slopes where required	C1	U			L		I		0	0	0	1	I	
T	B	03	02		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, subcatchment delineation, sufficient water storage structures, engineered flow channels, effective revegetation techniques, rehabilitation monitoring, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, prompt remediation and causal feedback loop to water management system review	C1	U			L		I		0	0	0	1	I	
T	B	03	03		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Existing rehabilitation of waste rock emplacements, downstream sedimentation controls, prompt revegetation, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, undertake repairs and maintenance as required, prompt remediation and causal feedback loop to water management system review	C2	P			L		II		0	0	1	0	II	
T	B	03	04		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, modify revegetation methods and techniques and other contributing factors to improve the likelihood of revegetation success on rehabilitation slopes, rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.	C2	P			L		II		0	0	1	0	II	

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		Causes (Triggers / Indicators)	Impacts (Consequences)	Controls	Likelihood - Frequency		Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance							
T B	04	Non-polluting - geochemical risk																				
T B	04 01	Acid and saline drainage generation	Adverse waste rock geochemistry	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts	Negative NAPP waste rock materials, low propensity for saline drainage generation. All waste material to be removed and followed by confirmatory geochemical testing of exposed subsoil. Monitoring and assessment of runoff water quality.	C1	U			L			I			0	0	0	1	I		
T B	05	Non-polluting - other environmental harm																				
T B	05 01	Not applicable														0	0	0	0			
T B	06	Sustainable - PMLU															0	0	0	0		
T B	06 01	Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting and PMLU density metrics, and shortage of topsoil resources	Insufficient pasture productivity	Improving rehabilitation methodologies, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C2	P			L			II			0	0	1	0	II		
T B	06 02	Insufficient topsoil resources onsite available to undertake rehabilitation activities	Poor management practices, shortage of topsoil resources	Poor vegetation establishment, insufficient habitat suitable for native fauna, insufficient pasture productivity	Adequate topsoil stockpiling and management strategies, annual review of topsoil inventory	C2	U			M			II			0	0	1	0	II		
T B	06 03	Pests and weeds	Poor local, regional or site property management practices	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate	C1	U			L			I			0	0	0	1	I		
T C		Residual void lakes																				
T C	01	Safe																				
T C	01 01	Void overtopping	Extreme rainfall events beyond design capacity, insufficient water level monitoring	Increased hazard to humans and animals	Long term groundwater modelling and final void water balance confirms the final void will remain as a sink with no risk of overtopping. Void walls and base constructed to design criteria.	C1	R			L			I			0	0	0	1	I		
T C	01 02	Cattle, humans or wildlife access to the residual void	Insufficient warnings, barriers preventing access to hazardous areas, fencing/bunding breaks, unauthorised access	Falls, slips, trips impacting humans, livestock and wildlife. Livestock accessing void water for drinking	Signage, physical barriers, slope moderation, conduct a risk assessment of controls when designed and placed. Modify as required. Post closure monitoring.	C2	U			M			II			0	0	1	0	II		

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T	C	02	Stable - geotechnical risk																				
T	C	02	01	Final void walls subject to significant slope failure	Excessive slopes, inadequate design, not constructed to design, inadequate drainage controls, adverse weather event	Localised impacts to land (highwall) and residual void water quality	Slope moderation, final landform design, maximum slopes subject to engineered design, assessment of construction materials by a suitably qualified person, provision of adequate drainage infrastructure, geotechnical assessment undertaken at closure. Certification by a suitably qualified expert that the final landform is stable and constructed according to design criteria.	C3	P		M	M		III	III			0	2	0	0	III	M3
T	C	03	Stable - erosional risk																				
T	C	03	01	Initial/ongoing gully, pipe and/or sheet erosion of the void walls	Faults and fractures in the underlying geology, adverse weather events	Localised land impacts, water quality impacts (water contained within the pit)	Landform design in accordance with geotechnical assessment of the site, monitoring and management as required.	C3	P		L	M		II	III			0	1	1	0	III	M3
T	C	03	02	Initial/ongoing gully, pipe and/or sheet erosion of the void walls	Inadequate design, erodible topsoil and subsoils	Localised land impacts, water quality impacts (water contained within the pit)	Landform including highwalls and site drainage network to be constructed as designed. Monitoring of drainage network performance, prompt remediation. Certification by a suitably qualified person that the final landform is stable and constructed according to design criteria	C3	P		L	M		II	III			0	1	1	0	III	M3
T	C	03	03	Initial/ongoing gully, pipe and/or sheet erosion of the void walls	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts, water quality impacts (water contained within the pit)	Final void designed to prevent excessive runoff from entering the final void during rainfall events. Prompt remediation, post-weather event monitoring of final void water quality, high walls and low wall	C3	P			M			III			0	1	0	0	III	M3
T	C	03	04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, modify revegetation methods and techniques and other contributing factors to improve the likelihood of revegetation success on rehabilitation slopes, rehabilitation area monitoring and assessment, undertake repairs and maintenance as required	C3	P			M			III			0	1	0	0	III	M3
T	C	04	Non-polluting - geochemical risk																				
T	C	04	01	Release of void water to the receiving environment	Void long term water level lies above natural groundwater level, overtopping, floodwater ingress.	Adverse impacts to downstream surface water quality, groundwater quality and dependent ecosystems (including GDEs).	Long term groundwater modelling and final void water balance confirms the final void will remain as a sink with no risk of overtopping. Final voids are located outside PMF levels. Monitoring of pit water quality to be undertaken and assessed against model predictions. Geotechnical/geochemical assessment, groundwater monitoring program	C1	R			L			I			0	0	0	1	I	

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T C 05		Non-polluting - other environmental harm																				
T C 05 01		Not applicable																				
T C 06		Sustainable - PMLU																				
T C 06 01		Water quality not meeting requirements to support fauna habitat PMLU	Leaching of salts contained in in-pit waste rock materials, ingress of saline groundwater and concentration of salts by evaporation	Increased hazard to animal health and aquatic ecosystem health, confined to pit lake, water quality prevents pit lake from achieving fauna habitat PMLU	Long term groundwater modelling and final void water balance confirms the final void will remain as a sink with no risk of overtopping. Void walls and base constructed to design criteria to minimise the inflow of saline groundwater. Water quality monitoring program to allow early detection and management of poor water quality. Littoral zone to be seeded with aquatic flora species tolerant of saline conditions. Low wall treatments to include seeding and the placement of rocks and logs to provide fauna habitat and organic enrichment.	C4	P			H			IV			1	0	0	0	IV	M3	
T D		Residual void highwalls																				
T D 01		Safe																				
T D 01 01		Surface roughness (rockiness and depressions) in excess of that expected for the PMLU	Erosion gullies etc due to some dispersive subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife (terrestrial and aquatic)	Surface preparation measures (initial), maintenance controls (pre closure), rehabilitation monitoring and assessment, undertake repairs and maintenance as required, adequate safety bunding and fencing installed around highwall perimeter.	C3	P			M	M		III	III		0	2	0	0	III	M3	
T D 01 02		Slope steepness in excess of that expected for the PMLU	Landform not constructed to design	Safety hazard for personnel, stock and wildlife	Slope survey controls, reshaping to design, adequate safety bunding and fencing installed around highwall perimeter.	C3	P			M	M		III	III		0	2	0	0	III	M3	
T D 02		Stable - geotechnical risk																				
T D 02 01		Final void highwalls subject to significant slope failure	Excessive slopes, inadequate design, not constructed to design, inadequate drainage controls, adverse weather event	Localised land impact	Slope moderation, final landform design, maximum slopes subject to engineered design, assessment of construction materials by a suitably qualified person, provision of adequate drainage infrastructure, geotechnical assessment undertaken at closure. Certification by a suitably qualified expert that the final landform is stable and constructed according to design criteria.	C3	P			M	M		III	III		0	2	0	0	III	M3	
T D 03		Stable - erosional risk																				
T D 03 01		Initial/ongoing gully, pipe and/or sheet erosion of the high walls	Faults and fractures in the underlying geology, adverse weather events	Localised land impacts, water quality impacts (water contained within the pit lake)	Landform design in accordance with geotechnical assessment of the site, adequate safety bunding and fencing installed around highwall perimeter, monitoring and management as required.	C3	P			L	M		II	III		0	1	1	0	III	M3	

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T D 03 02		Initial/ongoing gully, pipe and/or sheet erosion of the high walls	Inadequate design, erodible topsoil and subsoils	Localised land impacts, water quality impacts (water contained within the pit lake)	Highwalls and site drainage network to be constructed as designed. Monitoring of drainage network performance, prompt remediation. Certification by a suitably qualified person that the final landform is stable and constructed according to design criteria and FOS	C3	P		M		III		0	1	0	0	III	M3
T D 03 03		Initial/ongoing gully, pipe and/or sheet erosion of the high walls	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts, water quality impacts (water contained within the pit lake)	Final void designed as to prevent excessive runoff from entering the final void during rainfall events. Prompt remediation, postweather event monitoring of final void water quality and high walls	C3	P		M		III		0	1	0	0	III	M3
T D 03 4		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, modify revegetation methods and techniques and other contributing factors to improve the likelihood of revegetation success on rehabilitation slopes, rehabilitation area monitoring and assessment, undertake repairs and maintenance as required	C3	P		M		III		0	1	0	0	III	M3
T D 04		Non-polluting - geochemical risk																
T D 04 01		Acid and saline drainage generation	Adverse waste rock geochemistry	Revegetation performance impacts, impacts to water contained within pit lake	Confirmed negative-NAPP materials and low risk of saline drainage. High wall rehabilitation to include reprofiling and topsoiling. Regular void water quality monitoring and assessment	C2	P		L		II		0	0	1	0	II	
T D 05		Non-polluting - other environmental harm																
T D 05 01		Not applicable											0	0	0	0		
T D 06		Sustainable - PMLU																
T D 06 01		Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate	C2	P		L		II		0	0	1	0	II	
T D 06 03		Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density metrics, and shortage of topsoil resources	Insufficient pasture productivity	Improving rehabilitation methodologies, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C2	P		L		II		0	0	1	0	II	

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							Health	Safety	Environment									
T E	Residual void low walls																	
T E 01	Safe																	
T E 01 01	Surface roughness (rockiness and depressions) in excess of that expected for the PMLU	Erosion gullies etc due to some dispersive subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), maintenance controls (pre closure), rehabilitation monitoring and assessment, undertake repairs and maintenance as required	C2	U		L	M		I	II	0	0	1	1	II	
T E 01 02	Slope steepness in excess of that expected for the PMLU	Landform not constructed to design	Safety hazard for personnel, stock and wildlife	Dump and slope survey controls, reshaping to design	C2	U		L	M		I	II	0	0	1	1	II	
T E 02	Stable - geotechnical risk																	
T E 02 01	Final void low walls subject to slope failure	Excessive slopes, inadequate design, not constructed to design, inadequate drainage controls, adverse weather event	Localised land impact	Slope moderation, final landform design, maximum slopes subject to engineered design, assessment of construction materials by a suitably qualified person, provision of adequate drainage infrastructure, geotechnical assessment undertaken at closure. Certification by a suitably qualified expert that the final landform is stable and constructed according to design criteria.	C1	R			L			I	0	0	0	1	I	
T E 03	Stable - erosional risk																	
T E 03 01	Initial/ongoing gully, pipe and/or sheet erosion of the low walls and high walls	Faults and fractures in the underlying geology, adverse weather events	Localised land impacts, water quality impacts (water contained within the pit)	Landform design in accordance with geotechnical assessment of the site, monitoring and management as required.	C2	P		L	L		II	II	0	0	2	0	II	
T E 03 02	Initial/ongoing gully, pipe and/or sheet erosion of the low walls and high walls	Inadequate design, erodible topsoil and subsoils	Localised land impacts, water quality impacts (water contained within the pit)	Landform including highwalls and site drainage network to be constructed as designed. Monitoring of drainage network performance, prompt remediation. Certification by a suitably qualified person that the final landform is stable and constructed according to design criteria	C1	U		L	L		I	I	0	0	0	2	I	
T E 03 03	Initial/ongoing gully, pipe and/or sheet erosion of the low walls and high walls	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts, water quality impacts (water contained within the pit)	Final void designed as to prevent excessive runoff from entering the final void during rainfall events. Prompt remediation, postweather event monitoring of final void water quality, high walls and low wall	C2	P			L			II	0	0	1	0	II	
T E 03 04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, modify revegetation methods and techniques and other contributing factors to improve the likelihood of revegetation success on rehabilitation slopes, rehabilitation area monitoring and assessment, undertake repairs and maintenance as required	C2	P			L			II	0	0	1	0	II	

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		Causes (Triggers / Indicators)	Impacts (Consequences)	Controls	Control Effectiveness	Likelihood - Frequency Likelihood - Probability	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance		
T F 04		Non-polluting - geochemical risk																	
T E 04 01		Acid and saline drainage generation	Adverse waste rock geochemistry; leaching of salts contained in overburden materials to void surface water and concentration of salts by evaporation	Revegetation performance impacts, impacts to pit lake water quality	In pit waste emplacement to be constructed to design specifications as prepared by an AQP. Negative NAPP waste rock materials, low propensity for saline drainage. Coal rejects to be encapsulated deep within waste emplacements. Routine confirmatory geochemical testing to inform rehabilitation. Regular monitoring and assessment of pit lake water quality.	C2	P		L		II			0	0	1	0	II	
T F 05		Non-polluting - other environmental harm																	
T E 05 01														0	0	0	0		
T E 06		Sustainable - PMLU																	
T E 06 01		Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate	C2	P		L		II			0	0	1	0	II	
		Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density metrics, and shortage of topsoil resources	Insufficient pasture productivity	Improving rehabilitation methodologies, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C2	P		L		II								
T F		Rehabilitated dams																	
T F 01		Safe																	
T F 01 01		Surface roughness (rockiness and depressions) in excess of that expected for the PMLU	Erosion gullies etc due to some dispersive subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), maintenance controls (pre closure), rehabilitation monitoring and assessment, undertake repairs and maintenance as required	C1	U		L		I			0	0	0	1	I	
T F 02		Stable - geotechnical risk																	
T F 02 01		Not applicable																	
T F 03		Stable - erosional risk																	
T F 03 01		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring and management as required, sediment controls during establishment	C1	U		L		I			0	0	0	1	I	

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T	F	03	02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, subcatchment delineation, sufficient water storage structures, engineered flow channels, adequate and effective revegetation techniques, rehabilitation monitoring and management as required	C1	U			L			I		0	0	0	1	I	
T	F	03	03	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Downstream sedimentation controls, revegetation, monitoring and maintenance	C2	P			L			II		0	0	1	0	II	
T	F	03	04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Rehabilitation failure/ vegetation disease/loss, climatic events (drought)	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt and effective revegetation establishment, revegetation monitoring and management as required	C2	P			L			II		0	0	1	0	II	
T	F	04		Non-polluting - geochemical risk																		
T	F	04	01	Not applicable																		
T	F	04	02																			
T	F	05		Non-polluting - other environmental harm																		
T	F	05	01	Not applicable																		
T	F	05	02																			
T	F	06		Sustainable - PMLU																		
T	F	06	01	Self sustaining vegetation communities not achieved	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Best practice rehabilitation methodologies implemented, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C1	U			L			I		0	0	0	1	I	
T	F	06	02	Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate	C1	U			L			I							
T	F	06	03	Insufficient pasture density/diversity and recruitment	Adverse climatic conditions, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density metrics, and shortage of topsoil resources	Insufficient pasture productivity	Best practice rehabilitation methodologies implemented, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C1	U			L			I		0	0	0	1	I	

Risk Type (T=Threat) Category Subcategory Item	Ref.	Risk Description				Control Effectiveness	Risk Evaluation					Risk Rating				Count				Final Risk Rating	Management Effectiveness	
							Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance						
T G		Retained dams																				
T G 01		Safe																				
T	G	01	01	Dam failure (overtopping) of retained structures	Extreme rainfall events beyond design capacity, insufficient water level monitoring	Downstream hazard to public	Only engineered water storage to be retained at closure; dam will be assessed as safe and stable by appropriately qualified person prior to relinquishment; volume is relatively small and water will be free of contaminants	C1	U		L			I			0	0	0	1		I
T G 02		Stable - geotechnical risk																				
T	G	02	01	Wall failure/dam break of retained structures	Extreme rainfall events beyond design capacity, insufficient water level monitoring	Downstream hazard to public	Only engineered water storage to be retained at closure; dam will be assessed as safe and stable by appropriately qualified person prior to relinquishment; volume is relatively small and water will be free of contaminants	C1	U		L			I			0	0	0	1		I
T G 03		Stable - erosional risk																				
T	G	03	01	Initial/ongoing gully, pipe and/or sheet erosion of dam embankments	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts, risk of not achieving PMLU	Good topsoil management practices; adequate/effective soil amelioration where required, grading and shaping of dam banks, prompt revegetation establishment of dam banks, revegetation monitoring and management as required	C2	U		M			II			0	0	1	0		II
T G 04		Non-polluting - geochemical risk																				
T	G	04	01	Poor water quality in retained water storages	Adverse geochemical characteristics of disturbed materials in catchment	Downstream water quality impacts	Mine affected water to be removed from dam, water quality monitoring program to allow early detection and management of poor water quality	C1	U		L			I			0	0	0	1		I
T G 05		Non-polluting - other environmental harm																				
T	G	05	01	Not applicable													0	0	0	0		
T G 06		Sustainable - PMLU																				
T	G	06	01	Water quality in retained storages not meeting PMLU water quality requirements	Adverse geochemical characteristics of disturbed materials in catchment or other sources of contamination	Livestock health	Mine affected water to be removed from dam, water quality monitoring program to allow early detection and management of poor water quality	C1	U		L			I			0	0	0	1		I
T H		Diversion drains																				
T H 01		Safe																				
T	H	01	01	Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Challenging subsoils/ topsoils, inadequate surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), monitoring, maintenance controls (pre-closure)	C1	U		L			I			0	0	0	1		I

Ref.	Risk Type (T=Threat) Category Subcategory Item	Risk Description			Risk Evaluation				Risk Rating		Count				Final Risk Rating	Management Effectiveness
		Causes (Triggers / Indicators)	Impacts (Consequences)	Controls	Control Effectiveness	Likelihood - Frequency	Likelihood - Probability	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Count	Count	Count	Count		
T H 01	01	Stable - geotechnical risk			C3	P		M		III	0	1	0	0	III	M2
T H 01	01	Failure of bank stability	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts												
T H 01	01	Stable - erosional risk			C3	P		M		III	0	1	0	0	III	M2
T H 01	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts, risk of not achieving designated PMLU												
T H 01	02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	C2	U		M		II	0	0	1	0	II	
T H 01	03	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	C3	P		M		III	0	1	0	0	III	M2
T H 01	04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Rehabilitation failure/ vegetation disease/loss, climatic events (drought)	Localised land impacts and downstream water quality impacts	C2	U		M		II	0	0	1	0	II	
T H 01	01	Non-polluting - geochemical risk														
T H 01	01	Not applicable									0	0	0	0		
T H 01	01	Non-polluting - other environmental harm														
T H 01	01	Not applicable									0	0	0	0		
T H 01	01	Sustainable - PMLU			C2	U		M		II	0	0	1	0	II	
T H 01	01	Failure to establish suitable vegetation for the PMLU	Adverse climatic conditions, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density/ diversity metrics	Failure to establish target vegetation, increased erosion and instability of the banks, increased risk of not achieving designated PMLU												
				Landform design moderating slope, suitable topsoil management practices, prompt revegetation establishment on drain embankments, rehabilitation management and maintenance activities, and performance monitoring.												

Ref.	Risk Type (T=Threat) Category Subcategory Item	Risk Description				Risk Evaluation		Risk Rating				Count				Final Risk Rating	Management Effectiveness
		Causes (Triggers / Indicators)	Impacts (Consequences)	Controls	Control Effectiveness	Likelihood - Frequency Likelihood - Probability	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Count	Count	Count	Count	Count		
T H 01 02		Pests and weeds	Poor monitoring and corrective actions for pests and weed management	Increased risk of not achieving designated PMLU	C2	P		L		II	0	0	1	0	0	II	
T I		Mine infrastructure areas															
T I 01		Safe															
T I 01 01		Surface roughness (rockiness, depressions) in excess of that expected for PMLU	Inadequate surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	C2	P		L		II	0	0	1	0	0	II	
T I 02		Stable - geotechnical risk															
T I 02 01		Not applicable															
T I 03		Stable - erosional risk															
T I 03 01		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	C1	U		L		I	0	0	0	1	0	I	
T I 03 02		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	C1	U		L		I	0	0	0	1	0	I	
T I 03 03		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	C2	P		L		II	0	0	1	0	0	II	
T I 03 04		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Rehabilitation failure/ vegetation disease/loss, climatic events (drought)	Localised land impacts and downstream water quality impacts	C2	P		L		II	0	0	1	0	0	II	
T I 04		Non-polluting - geochemical risk															
T I 04 01		Not applicable									0	0	0	0	0		
T I 05		Non-polluting - other environmental harm															
T I 05 01		Contaminated land	Operational phase industrial use of land	Land contamination, surface water impacts	C2	U		M		II	0	0	1	0	0	II	

Ref.	Risk Description				Control Effectiveness	Risk Evaluation				Risk Rating				Count				Final Risk Rating	Management Effectiveness
	Risk Type (T=Threat) Category Subcategory Item					Likelihood - Frequency Likelihood - Probability	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance	Health Safety Environment Compliance									
															Causes (Triggers / Indicators)	Impacts (Consequences)	Controls		
T I 06	Sustainable - PMLU																		
T I 06 01	Self sustaining grazing native vegetation community not achieved	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Best practice rehabilitation methodologies implemented, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C2	P		L		II				0	0	1	0	II	
I 06 02	Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate	C2	P		L		II				0	0	1	0	II	
0 I 06 03	Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density metrics, and shortage of topsoil resources	Insufficient pasture productivity	Best practice rehabilitation methodologies implemented, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required	C1	U		L		I				0	0	0	1	I	
T J	Retained infrastructure																		
T J 01	Safe																		
T J 01 01	Not applicable														0	0	0	0	
T J 02	Stable - geotechnical risk																		
T J 02 01	Not applicable														0	0	0	0	
T J 03	Stable - erosional risk																		
T J 03 01	Initial/ongoing gully, pipe and/or sheet erosion of retained areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Grading and shaping, monitoring and management as required	C2	P		L		II				0	0	1	0	II	
T J 03 02	Initial/ongoing gully, pipe and/or sheet erosion of retained areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Suitable sedimentation and drainage controls implemented, monitoring and maintenance	C2	P		L		II				0	0	1	0	II	
T J 04	Non-polluting - geochemical risk																		
T J 04 01	Not applicable														0	0	0	0	
T J 05	Non-polluting - other environmental harm																		
T J 05 01	Contaminated land	Operational phase industrial use of land	Land contamination, downstream surface water impacts	Appropriate infrastructure management; storage and bunding of hazardous materials, housekeeping and proactive spills management. Phase 1 assessment at closure	C2	U		M		II				0	0	1	0	II	
T J 05 02															0	0	0	0	
T J 06	Sustainable - PMLU																		
T J 06 01	Not consistent with surrounding land use	Not consistent with designated PMLU	Not consistent with designated PMLU	Infrastructure retained in accordance with landholder agreement	C1	U		L		I				0	0	0	1	I	

Rehabilitation transect pro-forma

Project:				
Date:		Season:	Wet	Dry
Recorder:				
Transect name:				
Start point:	Easting:		Northing:	
End point:	Easting:		Northing:	
Datum:			Zone:	
Photo No:	Start (0 m):	Mid (50 to 0 m)	Mid (50 to 100 m)	End (100 m):

Site Location:	
Landscape Context*:	
Notes:	

* rocky hill, slope, valley bottom, floodplain, clay plains, etc.

Erosion pattern [^]	Slope (°)	Slope aspect# (e.g. Slope direction in degrees)

[^] refers to the combination of local relief and slope class (refer to Speight (2009) classification system attached).

At the mid-point record the direction in degrees, of the downward slope of the transect. For flat areas record a dash.

Rehabilitation transect pro-forma

Disturbance	Severity of Disturbance (circle relevant score)			Disturbance	Severity of Disturbance (circle)
	Proportion*	Age*	Height*		
Storm damage Estimate the proportion of the crown cover damaged at the site and the age of the damage.	0 1 2 3	1 2	N/A	Remnant	Yes No
Vehicle tracks Record old or recent tracks present at the site. Record proportion and age of the site affected.	0 1 2 3	1 2	N/A	Weeds Estimate percentage cover of exotic plant species. Sum of cover for all weed species.	Cover %:
Fire Record proportion of the site burnt, age and tallest vegetation affected.	0 1 2 3	1 2	1 2 3	Grazing Evidence of grazing (damage to ground layer plants, evidence of livestock faeces or tracks). ^Severe means major impact on groundcover abundance or composition.	Not apparent Present ^Severe
*Proportion: 0 = 0; 1 ≤ 1%; 2 1-5%; 3 ≥5% *Age: 1 ≤ 3 yrs. (short term impact still evident); 2: >3yrs * Fire height: 1 ≤1m; 2 1-6m; 3 6-12 m				Clearing Proportion of site previously cleared / thinned and regrown	No Present Severe
Other (note any other disturbance):					

*Leave blank where disturbance is absent

Rehabilitation transect pro-forma

Erosion classification	Minor	Moderate	Severe	Extreme	Notes/observations
No. of rills	< 15	15–30	31–50	> 50	
Average depth (cm)	< 10	10–30	30–60	> 60	
Proportion of site affected by disturbance (%) ¹	< 1	1–5	> 5	—	

* Provide GPS co-ordinates for any areas of moderate or heavy erosion

Geology:			
Soil description:			
Soil sample taken:	YES / NO	Date:	
Sample ID:		Time:	

Topsoil	5 m	10 m	15 m	20 m	25 m	30 m	35 m	40 m	45 m	50 m
Depth (cm)										

Canopy coverage (length of tape under canopy)	Total (m)	%
(example) 0–4, 8–13, 28–31, 45–48	= 15/50 * 100	30

Additional notes (sketch if required)

Rehabilitation transect pro-forma

[illegible]

Species dominance (D, CD, A, O)							Species	Woody stem count	Sample #/code	Photo #	Ground cover percentage*									
E	T1	T2	T3	S1	S2	G					Q1	Q2	Q3	Q4	Q5	Q6	A7	Q8	Q9	Q10
							16.													
							17.													
							18.													
							19.													
							20.													
							21.													
							22.													
							23.													
							24.													
							25.													
							26.													
							27.													
							28.													
							29.													
							30.													
							31.													

Key: D = dominant, CD = Co-Dominant, A = Associated and O = Occasional

*To be assessed as per ground cover assessment methodology and includes cover of bare ground, organic litter, rock and foliage cover

Slope class							
Class	LE Level	VG Very gently inclined	GE Gently inclined	MO Moderately inclined	ST Steep	VS Very steep	PR Precipitous
Percentage	<1	1–3	3–10	10–32	32–56	56–100	100
Degrees (rounded to nearest whole number)	0–0°35'	>0°35'– 1°45'	>1°45'– 5°45'	>5°45'–18°	>18°–30°	>30–45	>45
Relief class	Erosional landform pattern						
M Very high >300 m (about 500 m)	–	–	–	RM Rolling mountains	SM Steep mountains	VM Very steep mountains	PM Precipitous
H High 90– 300 m (about 150 m)	–	–	UH Undulating hills	RH Rolling hills	SH Steep hills	VH Very steep hills	PH Precipitous hills
L Low 30– 90 m (about 50 m)	–	–	UL Undulating low hills	RL Rolling low hills	SL Steep low hills	VL Very steep low hills	B Badlands
R Very low 9– 30 m (about 15 m)	–	GR Gently undulating rises	UR Undulating rises	RR Rolling rises	SR Steep rises	B Badlands	B Badlands
P Extremely low <9 m)	LP Level plain	GP Gently undulating plain	UP Undulating plain	RP Rolling plain	B Badlands	B Badlands	B Badlands

Source: Speight (2009), table 2

Figure C1 Types of erosional landform patterns by slope and relief class (Source: after Neldner 2019)

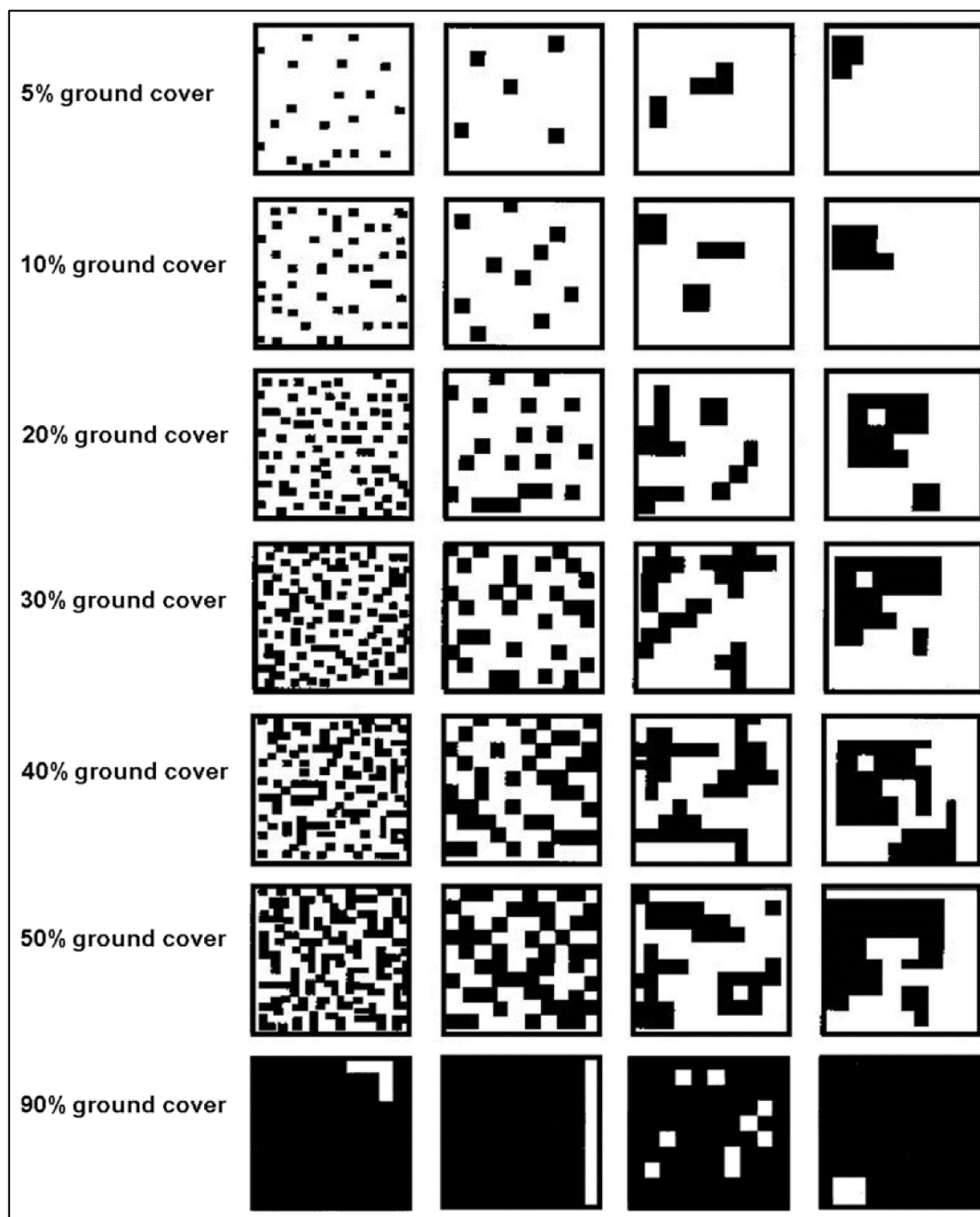


Figure C2 Guide to estimating ground cover percentage (Eyre et al. 2017)

Table C2 Soil profile proforma

[Site Description]

Date:			Site:		
Location:			Coordinates:	E	N
Landform Pattern:			Micro Relief:		
Landform Element:			Rock Outcrops:		
Morphological Type:			S C Fragments:		
Site Disturbance:			Substrate:		
Erosion:			Surface Condition:		
Landform	Elevation:		Permeability:		
	Slope (%):		Drainage:		
	Relief:		Run-off:		

[Soil Description]

Horizon	Depth (mm)	Boundary	Colour	Mottles	Texture	Coarse Fragments	Structure	Segregations	Consistency	Field pH	

Vegetation

Notes

Appendix: Pasture Productivity Data Sheets

Table D1 Pasture height record sheet

Paddock Name:			
cm (A)	Place a tick in the appropriate row	No. measurements (B)	A x B
0			
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20+			
	Total number of measures and pasture heights (C)		
	Total height of pastures (D)		
	Average pasture height = D/C		
	Average pasture mass <u>kgDM/ha</u>		

Source: after Meat & Livestock Australia 2019

Table D2 Approximate relationship between pasture height and kg DM/ha

Height (cm)	Lightly grazed 50 % green	Moderately grazed 100% green	Dense 100% Green
1	250	400	500
2	500	700	800
3	600	1000	1100
4	800	1200	1400
5	1000	1400	1700
6	1150	1600	2000
7	1300	1700	2300
8	1450	1900	2600
9	1600	2000	2800
10	1700	2200	3000

Source: after Meat & Livestock Australia 2019

Wednesday 4th December 2024

**RE: P-EA-100114292: Landowner
Retained Infrastructure**



Attn: **Business Centre Coal**
Department of Environment, Tourism, Science and Innovation
PO Box 3028
Emerald QLD 4720

By Email to: CRMining@des.qld.gov.au

P-EA-100114292: Magnetic South Pty Ltd – Landholder statement regarding intent to retain site infrastructure

Magnetic South Pty Ltd (Magnetic South) has considered the potential economic benefits of retaining infrastructure proposed to be constructed as part of the Gemini Coal Mine. Infrastructure such as access roads, dams and workshops are consistent with the current land use and approved grazing post-mining land use (PMLU).

Magnetic South is the landholder and the environmental authority holder of the properties underlying ML 700056 upon which environmentally relevant activities are proposed to be undertaken, and therefore wishes to advise the Department of Environment, Tourism, Science and Innovation (DETSI) its intention to retain the following infrastructure for use in future agricultural undertakings:

Infrastructure	Description
Access roads and tracks	Roads to be used for equipment access, mustering, firebreaks and general transportation around the properties.
Water storages	Raw water and sediment dams are to be used for stock watering purposes and erosion and sediment control structures where required.
Workshop	For machinery and storage associated with pastoral activities.
Powerline	Used to provide grid electricity to the retained workshop to facilitate pastoral activities.

Water storages and infrastructure to be retained have been identified as RA8 and RA10, respectively, in the proposed PRCP. These locations are further identified in the spatial information submission accompanying this application.

MAGNETIC SOUTH Pty Ltd

Suite 6D, Level 6 | 102 Adelaide Street | Brisbane City, QLD 4000
magnetic-south.com.au

Magnetic South Pty Ltd understands its obligations and general environmental duty under the Environmental Protection Act 1994 to not carry out any activity that causes or is likely to cause environmental harm unless all reasonable and practicable measures to prevent or minimise the harm are taken. To that end, the infrastructure listed above will be rehabilitated and/or maintained sufficiently so that the structures do not pose harm to future agricultural undertakings or the receiving environment.

Yours sincerely,



Mr James Xu
Magnetic South – Resource Development – Divisional Manager
(BSc(Geology) MBA MAusIMM)

Dated: 4/12/2024