ARUMPO MINE REHABILITATION RISK ASSESSMENT

GENERAL RISKS

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Insufficient skills and experience of rehabiliation personnel	Inabiltiy to complete key rehabilitation activities	4	4	Very High	Qualified Mine Manager and Environmental Consultant appointed	2	2	Low
Lack of clearly defined responsibilities	Lack of understanding of responsibilities	4	4	Very High	Position descriptions, defined objectives, MOP, Rehab Management Plan	2	2	Low
Insufficient funding/prioritisation of rehabilitation activities	Rehabilitation not completed	5	5	EXTREME	MOP Plans, Rehabilitation Management Plan, Regulatory inspections	2	2	Low

Active Mining Phase of Rehabilitaion

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Inadequate salvage of top soil	Lack of top soil for rehabilitation completion	3	4	High	300mm of top soil prestripped- verified by survey, stock balance maintained	2	2	Low
Mix up of Stockpiles/burying top soil	Lack of top soil for rehabilitation completion	3	4	High	Stocks labelled on mine plan, seperated from product stockpiles	2	2	Low
Limited Pre-existing Top Soil stocks	Shortage of top soil resource	4	4	Very High	Stock evaluation completed, stocks verified by survey	2	2	Low
Top soil/vegetation clearing conducted in adverse weather or seasonal conditions	Potential damage/loss of resource	4	4	Very High	Tree clearing in late summer/autumn, top soil removal in dry conditions	2	2	Low
Adverse geochemical/chemical composition of overburden and top soil	Potential PAF material/contamination	1	1	Rare	No PAF material, contaminated soil removed from site	1	1	Rare
Handling and containment of geochemically or geotechnically unstable tailings	Technical instability of backfill	1	1	Rare	No tailings or processing conducted onsite	1	1	Rare
Adverse quality and quantity of surface and groundwater	Erosion, Sedimentation, contamination of groundwater	4	4	Very High	Mining well above water table, sediment basins/drains in place, diversion channel to Emu Tank	2	2	Low

Decommissioning Phase of Rehabilitation

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Impact on heritage items	Damage to or identification of items of heritage value	4	3	High	Field survey coducted- low risk determined, operations to cease if items discovered, training of site personnel	1	1	Rare
Hazards associated with retained infrastructure	Failure to remove mine site infrasructure	3	2	Medium	All site infrastructure is portable, except phone tower and pad, some roads to remain with landowner consent	1	1	Rare
Contamination from associated activities- storage and use of hydrocarbons	Contamination of soil	3	4	High	No bulk diesel storage onsite, hydrocarbons stored in bunded container, PIMRP, Fuel/Oil spill SOP, Hazard Inspections, Weekly Mine Site Inspection, SDS, Refuelling SOP	2	2	Low
Contamination from associated activities- sewerage	Contamination of soil	4	3	High	Sewerage contained and disposed of	2	2	Low
Contamination from associated activities- dirty water	Sedimentation build up	2	2	Low	Drains and sumps in place, regularly cleaned out, water diversion in place	1	2	Very Low
Generation of waste from demolition process	Waste left onsite	2	3	Medium	Site infrastructure is portable, concrete phone tower pad will be removed at mine closure	1	2	Very Low

Landform establishment phase of Rehabilitation

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Unstable landform/mass movement due to poor design	Landform failure of backfill	3	3	Medium	Mine Plan for backfill design, 3:1 maximum slope on backfill, compaction during overburden repacement, survey, water management	2	2	Low
Exposure/release of geochemically/geotechnically adverse material	Contaminated or unstable backfill	1	1	Rare	All backfill material inert, geotechnically stable	1	1	Rare
Final landform unsuitable for final land use	Land does not meet requirements for grazing	4	4	Very High	Mine Plan- backfill design, adequate Top soil repacement, stable slope angles, cleared debris replaced, seed application if required, weed spraying undertaken	2	2	Low
Final landform not suitable for target plant species	Landform does not support regrowth of vegetation	4	4	Very High	As above, ripping of hard stand and laydown areas	2	2	Low

Growth/Medium Development Phase of Rehabilitation

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Physical and structural properties of substrate	Substrate unsuitable to support revegetation	3	4	High	Top soil stored in stockpiles, 300mm replaced, replaced late summer/early Autumn, can seed if required	2	2	Low
Top soil deficit for rehabilitation activities	Lack of top soil for rehabilitation completion	3	4	High	Verification of current stocks, accurate removal of top soil pre-strip, verification of pre-strip volumes by survey, maintain up to date Top soil stock balance	2	2	Low

Ecosystem and Land use Establishment Phase of Rehabilitation

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Weed infestation	Introduced weeds or lack of weed control	4	4	Very High	Weed control program in place with Land Owner, vehicle cleaning and inspections prior to entering site, Top soil taken from within mine lease	2	2	Low
Inappropriate rehabilitation techniques	Inappropriate rehabilitation techniques- including fleet	4	4	Very High	Progressive rehab, Rehab Plans submitted to Regulator, Proven rehab techniques and Approved Plan	2	2	Low
Inappropriate revegetation species mix for rehab	Introduction of new species or lack of vegetation	4	4	Very High	Top soil stockpiled for final use, spraying program in place, Seed application if required	2	2	Low
Weather and climate influences	Drought or bush fire	4	4	Very High	Replace Top soil at end of summer, fire break, stumps replace to reduce wind erosion, water management- sumps/drains, diversion bank, can water rehab areas	2	2	Low
Availability of areas for revegetation in optimal season conditions	Areas rehabed at wrong time of year- failed rehab	3	3	Medium	Annual Rehab Plan, understanding of key objectives, adequate capital and resources to complete, past practice	2	2	Low

Ecosystem and Land use development of Rehabilitation

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Weather and climate influences	Drought, bush fire, climate change	4	4	Very High	Replace Top soil at end of summer, fire break, stumps replace to reduce wind erosion, water management- sumps/drains, diversion bank, can water rehab areas	3	2	M
Long term water quality/quantity issues	Damage/erosion to rehab areas, build up of sediment	3	3	Medium	Diversion bank in place, water management plan, control of water flow to dam, cleaning/maintenance of sediment traps and drains	2	2	Low
Damage to rehab areas- caused by Fauna, domestic stock, vandalism, vehicles, fire	Potential damage to rehab areas	4	3	High	mine lease fenced, vehicles to be kept off rehab areas, mine is remote- vandals unlikely, fire break in place, grids installed at access points	2	2	Low
Limited vegetation redevelopment	Lack of growth of flora from Top soil stocks	4	3	High	Adequate top soil stocks, Top soil management as per SOEE, progressive rehab, exclusion zones on rehab areas, no grazing on mine lease	2	2	Low
Redisturbance of established rehab areas	rework of rehab areas	3	4	High	Mine Plan in place, areas previously mined have no remaining bentonite, use existing roads and infrastructure	2	2	Low
Insufficient establishment of target species/limited species diversity	Lack of regrowth for grazing purposes	3	3	Medium	Top soil resource from mine site, schedule top soil replacement for correct season, possibility of seeding if required, past successful rehab techniques, stable landform	2	2	Low
Limited vegetation structural development for final landuse	Unable to establish grazing pasture	4	3	High	As above	2	2	Low
Lack of infrastructure to support final land use	Failure to establishm of grazing pasture	3	3	Medium	Fence around lease, water diversion bank, water managenet- sumps/drains, Access Road to be left in place, firebreak installed, established rehab techniques, inspections, Plans	2	2	Low
Erosion and failure of landform, water management and storage structures	Failure of landform and rework of water management	4	4	Very High	Stable batter angles in final mine pit, stable landform design, monitoring regrowth, no stock until stable, water managemnt plan and diversions in place	2	2	Low
Lack of infrastructure to support final land use	Landowner unable to use land for grazing	5	4	Extreme	Access Road to remain, fencing in place, grids at gates, water diversion to dam (off mine lease),	2	2	Low

Mine subsidence affected areas

		Initial				Residual		
Risks	Key Impacts	Consequence	Likelihood	Risk Rating	Controls	Consequence	Likelihood	Risk Rating
Extended water ponding	Water ponding in low lying areas	3	3	Medium	Final landform design, water management, sumps/drains, water diversion bank in place	2	2	Low
Subsidence cracking	Erosion of landform	3	2	Medium	Final gradients of backfill, water management, diversion banks, cross ripping if required	2	2	Low

Likelihood / What's the chance of the risk occuring?	Consequence: How severe could the outcomes be if the risk event occurred? →	1 Insignificant	2 Minor	3 Significant	4 Major	5 Severe
↑	5 Almost Certain	5 Medium	10 High	15 Very high	20 Extreme	25 Extreme
	4 Likely	4 Medium	8 Medium	12 High	16 Very high	20 Extreme
	3 Moderate	3 Low	6 Medium	9 Medium	12 High	15 Very high
	2 Unlikely	2 Very low	4 Low	6 Medium	8 Medium	10 High
	1 Rare	1 Rare	2 Very low	3 Low	4 Medium	5 Medium