

APPENDIX 1

Rehabilitation Plan

BACKGROUND

One of the principles adopted by the International Council on Mining and Metals (ICMM) for sustainable development for mining is:

“rehabilitating land in accordance with appropriate post-mining land use”.

Rehabilitation for the Warwick Lease Areas will comply with the ICMM principles and the hierarchy for mine rehabilitation (EP Act) in the following manner:

1. *avoid disturbance that will require rehabilitation* – The original location for the access road to the proposed open pit on MLA50237 was moved to avoid disturbance to natural grasslands. The original waste dump location on MLA50237 was moved to avoid the clearing of 17 potential habitat trees.
2. *reinstate a “natural” ecosystem as similar as possible to the original ecosystem*. The areas proposed for mining activities are highly disturbed as a result of previous landuses and now support regrowth vegetation or pasture lands. Rehabilitation will include replanting of native flora species endemic to the local area to reflect densities and composition of flora species present.
3. *develop an alternative outcome with a higher economic value than the previous land use* NA
4. *reinstate previous land use (e.g. grazing or cropping)* Rehabilitation will include plantings of native and pasture grasses.

REHABILITATION PLAN

Rehabilitation and revegetation efforts conducted within the Unimin Mining Lease Area aim to re-establish vegetation communities that reflect pre-disturbance composition and abundance and are designed to reinstate the pre-disturbance land use.

Rehabilitation will be conducted sequentially as mining operations cease and land is subject to its final contouring or when disturbed areas, e.g. waste dump are no longer needed for operations. The objectives of the rehabilitation plan are presented in **Table 1**.

REHABILITATION TARGETS

To achieve the rehabilitation objectives, a recommended species planting schedule for all

areas associated with the mining activities is presented in **Table 2**. Performance indicators and targets for each of the Target Climax Communities are contained in **Table 3**.

REHABILITATION TECHNIQUES

All existing native species, including mature and regrowth trees and saplings, shrubs, grasses and forbs located outside of the potential impact areas, are to be retained and managed as part of the rehabilitation phase and maintenance.

Where planting is required, recommended species presented within **Table 2** should be used. Recommendations regarding size of planting stock, mulch specifications and any other necessary treatments, such as weed control, are detailed in **Table 4**.

For all rehabilitation areas, habitat features such as rocks, fallen branches and dead trees and shrubs in are to be retained *in situ* unless they pose a safety risk to workers.

GENERAL REHABILITATION REQUIREMENTS

All declared weed and exotic species are to be removed according to the methods set out in the Vegetation Management Plan (VMP). All weed species listed in the VMP are to be eradicated from the rehabilitation area prior to any planting taking place. Other exotic and environmental weed species are to be controlled as necessary to protect rehabilitation plantings and to encourage natural regeneration of native species.

Where woody trees and shrubs are removed their roots shall be left to rot in situ as the roots help to prevent erosion.

Rehabilitation areas must be protected from impacts caused by grazing cattle. Fencing that excludes cattle but allows native fauna to access these areas should be erected prior to commencing rehabilitation.

MAINTENANCE AND WEED MANAGEMENT

The maintenance plan provided in **Table 5** applies to the site until the rehabilitation area is self sufficient and self-perpetuating.

Specific management requirements for declared plant species are provided the VMP.

Table 1 – Rehabilitation Objectives

	Objective	Details
1	Identify and delineate rehabilitation and revegetation areas	Base-line studies have identified the condition and extent of vegetation communities across the Site.
2	Prioritise and schedule rehabilitation works	Areas degraded as a result of mining activities are to be subject to staged rehabilitation when the land becomes available following final land contouring.
3	Control and eradicate declared and invasive weeds	Control and eradicate (where practical) state declared weeds (as listed under the <i>Land Protection (Pest and Stock Route) Management Act 2002</i>) and priority environmental weeds on the site through appropriate weed control methods.
4	Conserve and enhance existing native vegetation	Identify native vegetation to be retained, control weed species and undertake supplementary planting with native species to support existing native vegetation where necessary.
5	Conserve and enhance ecological process and habitat values	Conserve and identify existing habitat values, control weeds to encourage a diversity of wildlife, remove barriers to fauna movement.

Table 2 – Species Planting Schedule

Recommended Species	Common Name	Density	Notes
Open Pit Void MLA50237			
Tree layer		Species densities around water storage area to reflect pre-disturbance levels.	This area is to reflect a Eucalypt Woodland with a native grassy understory following rehabilitation works
<i>Eucalyptus tereticornis</i>	Queensland Blue Gum		
<i>Eucalyptus moluccana</i>	Gum Topped Box		
<i>Eucalyptus crebra</i>	Narrow-Leaved Ironbark	Seed of any mix of the recommended species to be liberally broadcast during conditions that will maximise germination (i.e. prior to rainfall events during the warmer months of the year).	
Ground Layer			
<i>Paspalidium distans</i>	Shotgrass		
<i>Imperata cylindrica</i>	Blady Grass		
<i>Digitaria brownii</i>			
<i>Enneapogon gracilis</i>	Slender Nineawn		
<i>Digitaria ramularis</i>			
<i>Dichelachne crinita</i>	Longhair Plumegrass		
<i>Austrostipa setacea</i>	Corkscrew Grass		
<i>Triodia mitchellii</i>	Buck Spinifex		
<i>Cymbopogon refractus</i>	Barbed-Wire Grass		
<i>Eragrostis brownii</i>	Brown's Lovegrass		
<i>Chloris ventricosa</i>	Tall Chloris		
<i>Bothriochloa macra</i>	Redleg Grass		
<i>Themeda triandra</i>	Kangaroo Grass		
<i>Aristida lignosa</i>			
<i>Panicum effusum</i>			
<i>Eulalia aurea</i>	Silky Browntop		
<i>Lachnagrostis filiformis</i>			
<i>Austrostipa verticillata</i>	Slender Bamboo Grass		
<i>Dactyloctenium radulans</i>	Button Grass		
Waste Dump MLA50237			
Tree layer		Species densities to reflect pre-disturbance levels.	This area is to reflect an Open Eucalypt Woodland with a native grassy understory following rehabilitation works
<i>Eucalyptus tereticornis</i>	Queensland Blue Gum		
<i>Eucalyptus moluccana</i>	Gum Topped Box		
<i>Eucalyptus crebra</i>	Narrow-Leaved Ironbark	Seed of any mix of the recommended species to be liberally broadcast during conditions that will maximise germination (i.e. prior to rainfall events during the warmer months of the year).	
Ground Layer			
<i>Paspalidium distans</i>	Shotgrass		
<i>Imperata cylindrica</i>	Blady Grass		
<i>Digitaria brownii</i>			
<i>Enneapogon gracilis</i>	Slender Nineawn		
<i>Digitaria ramularis</i>			
<i>Dichelachne crinita</i>	Longhair Plumegrass		
<i>Austrostipa setacea</i>	Corkscrew Grass		
<i>Triodia mitchellii</i>	Buck Spinifex		
<i>Cymbopogon refractus</i>	Barbed-Wire Grass		
<i>Eragrostis brownii</i>	Brown's Lovegrass		
<i>Chloris ventricosa</i>	Tall Chloris		
<i>Bothriochloa macra</i>	Redleg Grass		
<i>Themeda triandra</i>	Kangaroo Grass		
<i>Aristida lignosa</i>			
<i>Panicum effusum</i>			
<i>Eulalia aurea</i>	Silky Browntop		
<i>Lachnagrostis filiformis</i>			
<i>Austrostipa verticillata</i>	Slender Bamboo Grass		
<i>Dactyloctenium radulans</i>	Button Grass		
MLA50236, MLA50238 and MLA 50239			
As per EMP. Rehabilitate with pasture grasses.		No species recommended	Areas to be topsoiled and planted with pasture grasses.

Recommended Species	Common Name	Density	Notes
Roads And Tracks			
There are no species recommended for this area		No species recommended	These areas are to remain as access tracks post mine closure
Sediment Dams			
There are no species recommended for this area		No species recommended	These areas are to remain as stock dams post mine closure.

Table 3: Rehabilitation Targets

Rehabilitation Area	Rehabilitation Target	Performance targets
Open Pit Void MLA 50237	Eucalypt Woodland with native grassy understory surrounding retained water storage area	70% survival of canopy species outlined in Table 2 after 5 years. 50% cover of native grasses and ground layer species outlined in Table 2 after 5 years. - No woody weeds. <10% herbaceous weeds.
Waste Dump MLA 50237	Eucalypt Open Woodland with native grassy understory	70% survival of canopy species outlined in Table 2 after 5 years. 50% cover of native grasses and ground layer species outlined in Table 2 after 5 years. - No woody weeds. <10% herbaceous weeds.
MLA 50236 and MLA 50238	Improved pasture	- Eradicate extant weeds. - Maintain community condition of surrounding vegetation
Sediment Dams	Retained as stock dams	No performance targets provided
Roads and Tracks	Retained as farm access tracks	- Eradicate extant weeds. - Maintain community condition of surrounding vegetation

Table 4: Rehabilitation Methodology

Task	Recommendations
Delineate Rehabilitation Areas	Rehabilitation areas are to be clearly delineated on the ground with native fauna-fencing where necessary. Fencing will need to be designed to preclude cattle from entering rehabilitation areas.
Weed and Exotic Plant Removal and Control	Priority and environmental weeds (refer to Appendix 2 of the VMP) are to be removed immediately on detection. If using herbicides, particular care must be taken to avoid poisoning native species, particularly young saplings, native grasses and herbaceous species. Exotic grasses are to be treated (by spraying) 2-3 weeks prior to replanting – particular care must be taken to avoid spraying native grasses. Woody and herbaceous weed species are also to be treated prior to planting. Two weeks following spraying of rank exotic grasses, that are not required for pasture, these are to be knocked down by brushcutting – particular care must be taken to avoid slashing native species. For specific control requirements for priority weeds see Appendix 2 VMP.
Site Preparation	Any rubbish will need to be collected and disposed of offsite at a Council approved location or rubbish disposal depot.
Mulch	Mulching will be undertaken across the rehabilitation site when planting tubestock. Weed free mulch is to be applied to a depth of 100mm across the rehabilitation area.
Plant Supply	Seedlings shall be sourced from local provenance stock (where possible). Recommend species for rehabilitation are provided in Table 2. Densities are to be determined at a later date prior to initiation of rehabilitation activities. Planting stock shall be provided in forestry tubes with a minimum plant height of 20cm and a well developed root system. Seedlings are to be healthy and displaying signs of active growth – any plants displaying yellowing, disease, root curling or are root bound are not to be planted, nor are any plants with weeds growing in the pot.
Planting	Tubestock - Plant in a slight shallow twice the size of the tube container, ensuring rootball is just below soil surface. Fertiliser tablet to be placed adjacent to, but not touching, the rootball. Soil to be backfilled to the same level as when the plant was in the container Mulch to a depth of 100mm to surround plant, but not touch the stem. Seedlings are to be randomly arranged at the determined densities. Seedlings must be moist at time of planting, if necessary water stock prior to planting.
Watering	Seedlings are to be watered with a minimum of 5 – 10 litres of water each at the time of planting and then watered as part of general maintenance requirements.
Habitat Features	For all Rehabilitation Zones, habitat features such as rocks, fallen branches and dead trees and shrubs in all zones are to be retained in situ unless they pose a safety risk.
Maintenance and Monitoring	Plantings will be maintained for a period of 24 months during the rehabilitation phase.

Table 5: Maintenance Plan for Rehabilitation Works

Timing	Recommended Action
First three months after planting	Control weeds – Check for weeds monthly and control by hand removal, spot spraying e.g. of grasses, taking care not to damage planted and regenerating native species, including grasses and forbs. Watering – Water each seedling with a minimum of 5 – 10 litres of water weekly during the first month depending on prevailing weather conditions and then monthly or as necessary until seedlings are established (approximately 3 – 6 months). General Site Maintenance – Remove any rubbish dumped on site; check for signs of erosion; replace mulch as required. Replacement Planting – Replace dead or senescent plants according to the methods detailed in Table 4. Monitoring – Undertake regular monitoring.
3-24 months after planting	Control weeds – Continue monthly weed checks and control when necessary as specified for first three months. Watering – Continue to water each seedling as necessary until seedlings are established (approximately 3 – 6 months). Any replacement seedlings should be watered weekly during the first month following planting, then water as necessary until seedlings are established (approximately 3 – 6 months after planting). Replacement Planting – Replace dead or senescent plants according to the methods detailed in Table 4; and continue replacement planting until 95% survival rate achieved. Mulching – If mulch is depleted thereby allowing significant weed growth, replace mulch around affected plants with coarse forest mulch or sugar cane to a depth of 100mm and diameter of 1m, ensuring mulch does not contact any stems/trunks of native species. General Site Maintenance – e.g. Remove any rubbish dumped on site; check for signs of erosion; replace mulch as required. Monitoring – Undertake regular site monitoring tasks and photos.