

A member of the Rio Tinto Group

## Mesa K Remnant Mining Project

### Preliminary Rehabilitation Plan



Rehabilitated waste dump at Mesa K 2007

Prepared by  
Robe River Mining Company Pty Ltd

March 2008



Aerial view of Mesa K 2007



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## 1. INTRODUCTION

### 1.1 MESA K REMNANT MINING PROJECT

The Mesa K deposit is located in the Robe Valley area of the Pilbara region of Western Australia. It is approximately 4 kilometres (km) north of Robe's existing Mesa J operation and 11 km south-west of the town of Pannawonica.

Mesa K is located on Mining Lease AML 70/00248 Sec 104. The Mesa K deposit was previously mined from 1988 to 1995, producing approximately 48.2 million tonnes (Mt) of pisolite ore. After this time, the mine site was partially rehabilitated, although access to the open cut pits and remnant ore was retained.

### 1.2 PURPOSE AND SCOPE OF THE PRELIMINARY REHABILITATION PLAN

#### 1.2.1 Overview

The purpose of the Preliminary Rehabilitation Plan (PRP) is to describe the rehabilitation strategies which will be implemented to address environmental issues to the satisfaction of Robe and regulatory authorities at the completion of the proposed operations. The rehabilitation strategies are designed to contribute to maintenance free closure over the long term.

One of the key objectives of this plan is to ensure that planning for mine rehabilitation (and ultimately closure) commences in the early stages of project planning and is integrated with mine development planning and operations.

The PRP will provide mine planning and operations with a rehabilitation framework, which will help minimise the environmental impacts of the project and maximise rehabilitation success.

Key steps in rehabilitation for the Mesa K Remnant Mining Project are:

- the integration of rehabilitation into the mine plan to optimise the rehabilitation process and outcome
- minimising further disturbance to the site wherever possible, primarily by locating structures within previously disturbed areas
- utilising existing and proposed pit voids for the backfilling of waste rock and storage of low grade material where possible
- the removal and disposal of infrastructure not required for other uses
- rehabilitation of remaining disturbances
- post-rehabilitation maintenance and monitoring.

### 1.2.2 Relevance to other documents

The PRP is included in the Environmental Protection Statement (EPS) as a component of the proponent's environment management activities associated with the Mesa K Remnant Mining Project approval process.

The PRP will be incorporated into the site rehabilitation plan, once the Mesa K Remnant Mining Project becomes operational, and will be regularly reviewed during site operations to ensure it remains accurate and relevant.

### 1.2.3 Scope

The Mesa K project area currently hosts strategic infrastructure essential to existing and future Robe Valley operations. This includes:

- Mesa J to Cape Lambert main rail line
- Pannawonica to Mesa J access road
- Mesa J region explosives storage facility.

These assets are required for the existing Mesa J operation and future operations in the Robe Valley region. Closure and rehabilitation of these structures is addressed in the Pilbara Iron Greater Pannawonica Operations Closure Study. The Pilbara Iron Greater Pannawonica Operations Closure Study is currently undergoing internal review.

Accordingly the scope of this Preliminary Rehabilitation Plan is for rehabilitation of operations, disturbances and structures associated with the currently proposed Mesa K Remnant Mining Project.

## 2. BACKGROUND

### 2.1 PROJECT DESCRIPTION

The Mesa K deposit was previously mined from 1988 to 1995, after which it was partially rehabilitated. Access to the Mesa K open cut pits and remnant ore was retained. Minimal new infrastructure is required to recommence mining at this site. Mining at Mesa K is planned to recommence in July 2008 and will continue through 2010. The Mesa K Remnant Mining Project will operate as a satellite project to Mesa J, supplementing the reducing production from Mesa J.

The key characteristics of the Mesa K Remnant Mining Project proposal are:

- remnant mining of five (5) existing open cut pits: Gravel Yard pit, Central pit, West Pit South, West Pit North and Gully pit
- mining using conventional drill and blast, load and haul, occurring concurrently with Mesa J mainly through the dry season (nominally May to December), utilising equipment fleet, personnel and other resources from Mesa J
- haulage by truck of Run of Mine (ROM) ore from Mesa K to Mesa J using the existing mine access road.
- minor realignment and widening of the existing mine access road from Mesa K to Mesa J
- installation of transportable office, portable crib room, toilets, septic, water tank and generators at Mesa K.

Figure 1 shows the conceptual site layout. Locations and layout of proposed infrastructure, stockpiles and waste dumps may vary due to operational changes.

The main components of the Mesa K Remnant Mining Project are:

- expansion of five existing open cut pits
- minor realignment and widening of the existing mine access road
- backfilling of the Central Pit
- construction of waste dumps within the previous mine voids and disturbance areas
- addition to the existing Alpha dump, if possible to allow for re-profiling and rehabilitation
- backfilling to surface of the southern section of the Gravel Yard pit void
- construction of Low Grade stockpiles within pit voids and disturbance areas.

Detailed descriptions of the project are contained within the Mesa K Remnant Mining Project Environmental Protection Statement.

## 2.2 PLANNING PRINCIPLES

One of the key principles adopted for the Mesa K Remnant Mining Project to facilitate satisfactory environmental and rehabilitation outcomes is to minimise environmental impacts during development and operations, which will subsequently optimise rehabilitation success.

The following principles have been integrated into the mine planning processes for the Mesa K Remnant Mining Project as follows:

- minimise further disturbance to the site wherever possible
- utilise existing infrastructure at Mesa J to support the Mesa K Remnant Mining Project
- locate mining structures within existing disturbed areas wherever possible
- avoid disturbance to more sensitive locations where possible
- maximise recovery of limited topsoil to facilitate rehabilitation.

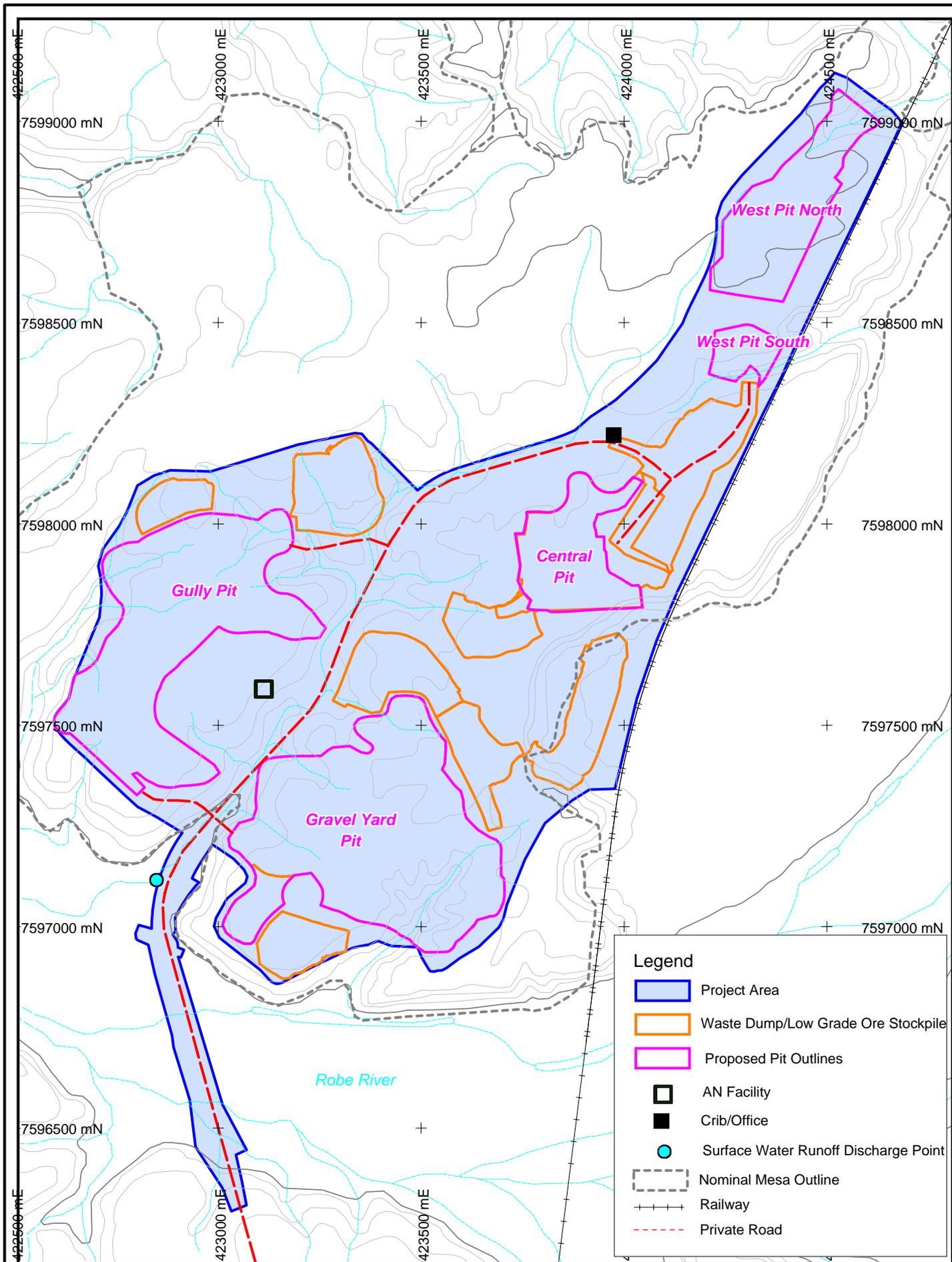


Figure 1 Mesa K Conceptual Mine Layout

### 3. REQUIREMENTS AND GUIDELINES

#### 3.1 STATUTORY REQUIREMENTS

##### 3.1.1 Environmental Protection Act 1986

The Preliminary Rehabilitation Plan (PRP) is consistent with the following documentation relevant to the Mesa K Remnant Mining Project and assessed under the *Environmental Protection Act 1986*:

- Mesa K Remnant Mining Project Environmental Protection Statement.

Rehabilitation related commitments in this document principally relate to:

- developing a PRP as part of the mine plan and project proposal
- minimising disturbance to remnant vegetation wherever possible
- undertaking progressive rehabilitation.

#### 3.2 RELEVANT ENVIRONMENTAL LEGISLATION

Beyond specific approval documentation, key environmental legislation relevant to mine closure and rehabilitation in Western Australia includes general provisions under the following:

- *Environmental Protection Act 1986*
- *Mining Act 1978*
- *Mines Safety and Inspection Act 1994.*

Other legislation relevant to mine closure and rehabilitation includes:

- *Aboriginal Heritage Act 1972*
- *Agriculture and Related Resources Protection Act 1976*
- *Bushfires Act 1954*
- *Conservation and Land Management Act 1984*
- *Contaminated Sites Act 2003*
- *Dangerous Goods (Transport) Act 1998*
- *Explosives and Dangerous Goods Act 1961*
- *Land Administration Act 1997*
- *Occupational Safety and Health Act 1984*
- *Rights in Water and Irrigation Act 1914*
- *Soil and Land Conservation Act 1945*
- *Waterways Conservation Act 1976*
- *Wildlife Conservation Act 1950.*

### 3.3 GOVERNMENT AND INDUSTRY GUIDELINES

Key government and industry guidelines relevant to mine closure and rehabilitation in Western Australia are listed in Table 1.

**Table 1 Key government and industry guidelines for mine closure and rehabilitation**

<b>Guideline</b>	<b>Purpose</b>
<i>Australian Minerals Industry (AMI) Code for Environmental Management (MCA 2000)</i>	Framework including consultation, progressive rehabilitation and reporting
<i>Strategic Framework for Mine Closure (ANZMEC/MCA 2000) (a joint government and industry guideline)</i>	Framework including planning, progressive rehabilitation and reporting.
<i>Guideline Safety Bund Walls Around Abandoned Open Pit Mines (Department of Minerals and Energy of Western Australia 1997)</i>	Design of abandonment bunds around open pits to prevent vehicular access.
<i>Mine Closure Guideline for Mineral Operations in Western Australia (Chamber of Minerals and Energy WA Inc. 2000)</i>	Framework including consultation, progressive rehabilitation and reporting.
<i>Mine Closure Policy (MCA 1999)</i>	Policy on mine closure.
<i>Mine Rehabilitation Handbook (MCA 1998)</i>	Stakeholder consultation and provisioning.
<i>Assessment Levels for Soil, Sediment and Water (DoE, V3 Nov 2003)</i>	Threshold levels for contaminated soils.
<i>ANZECC/ARMCANZ: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000</i>	Water quality criteria.
<i>The Commonwealth Environmental Protection Agency series 'Best Practice Environmental Management in Mining'</i>	Industry examples of best practice mining practices.
<i>Guidance for the Assessment of Environmental Factors: Rehabilitation of Terrestrial Ecosystems. Draft No. 6 (EPA 2006)</i>	Closure strategy and description of objectives, targets and review during mine operation.
<i>Leading Practice Sustainable Development Program for the Mining Industry, Mine Rehabilitation (Dept. of Industry, Tourism and Resources 2006)</i>	Industry examples of best practice mining practices for rehabilitation.
<i>Mining Environmental Management Guidelines, Mining in Arid Environments (DoIR 2006)</i>	Practical Guidance for rehabilitation.
<i>Guidance for the Assessment of Environmental Factors: Rehabilitation of Terrestrial Ecosystems. Draft No. 6 (EPA 2006)</i>	Closure strategy and description of objectives, targets and review during mine operation.

### 3.4 CORPORATE REQUIREMENTS

Rio Tinto, Expansion Projects and Pilbara Iron have established policies and standards to which all operations must adhere. Robe Operations are managed by Pilbara Iron and subscribe to the same standards. The key standards relevant to this document are listed below.

#### 3.4.1 Rio Tinto Environment Standards

Rio Tinto has developed and implemented a set of management standards relating to closure and rehabilitation. These standards outline the minimum level of compliance for all operations. The standards relevant to rehabilitation include:

- Mineral Waste Management Standard
- Land-Use Stewardship Standard
- Closure Standard.

### **3.4.2 Pilbara Iron Environmental Policy**

The policy sets out the specific direction and management commitment for environmental management. It incorporates the aim to leave areas as close as practicable to how we found them and to prevent pollution. To fulfil these aims it is required to minimise land disturbance and waste generation, continually update disturbance and closure plans and undertake progressive rehabilitation.

### **3.4.3 Pilbara Iron management plans and guidelines**

Key Pilbara Iron standards relevant to the PRP include:

- Soil Resource Management Procedure
- Pilbara Iron Landform Design Guidelines
- Rehabilitation Handbook.

## 4. STAKEHOLDER CONSULTATION

### 4.1 STAKEHOLDER IDENTIFICATION

Stakeholders in this context are defined as individuals, government agencies, community groups or others who may potentially be affected by mine closure and rehabilitation. Stakeholder consultation is a recognised component of the planning and rehabilitation process.

The key stakeholders identified for the Mesa K Remnant Mining Project are listed in Table 2 below.

**Table 2 Key stakeholders**

<b>Stakeholder sector</b>	<b>Organisation</b>
State government	Department of Environment and Conservation
	Department of Industry and Resources
	Department of Indigenous Affairs
	Department of Water
Local government	Shire of Ashburton
Indigenous groups	Kuruma Marthudunera
Non-government organisations and special interest groups	<i>Pastoralists</i>
	<ul style="list-style-type: none"> <li>• Yalleen Station</li> <li>• Yarraloola Station</li> </ul>
	<i>Conservation groups</i> <ul style="list-style-type: none"> <li>• Conservation Council of Western Australia</li> <li>• Wildflower Society of Western Australia</li> </ul>

### 4.2 PUBLIC CONSULTATION

Consultation with the stakeholders listed above has been undertaken during the development of the Mesa K Remnant Mining Project and Environmental Protection Statement (EPS). Rehabilitation has been an integral part of each stage of project planning. Further details regarding consultation are included in the EPS.

### 4.3 CONSULTATION PROCESS FOR CLOSURE PLANNING AND REHABILITATION

Rehabilitation of the Mesa K Remnant Mining Project is an integral part of the project and has been discussed with key stakeholders.

Consultation with respect to closure planning is incorporated in the Pilbara Iron Greater Pannawonica Operations Closure Study.

## 5. OBJECTIVES AND TARGETS

### 5.1 LAND USE

It is recognised that mining is a temporary land use and therefore rehabilitation objectives are to be consistent with the projected future land use or capability of the land.

The proposed post-mining land use objective for the Mesa K region is to return land to a condition suitable for pastoralism and heritage conservation following the completion of mining activities. It is recognised that the region allows for multiple land use and that future exploration and mining activities may also occur.

### 5.2 KEY OBJECTIVES

The Environmental Protection Authority (EPA) generally applies the following objective in its assessment of proposals that have a rehabilitation and closure component. This objective is considered relevant to this proposal.

- *To ensure as far as practicable, that rehabilitation achieves a stable and functioning landform that is consistent with the surrounding landscape and other environmental values.*

The management objective for rehabilitation of all Robe operations is to rehabilitate all disturbed areas to a standard that achieves a safe and stable landform, containing endemic plant communities that approximate those that existed prior to the commencement of disturbance. The objective of rehabilitation is to produce final landforms which are:

- safe
- stable
- support self-sustaining endemic vegetation communities
- free draining and non-polluting
- visually compatible with surrounding landscape.

To facilitate impartial assessment of the progress of rehabilitation, a preliminary set of rehabilitation performance criteria will be established. Regular monitoring of rehabilitation will identify any need to alter management techniques and determine whether the performance criteria are applicable or require revision. Revision of criteria is based on their capacity to reflect practical goals of rehabilitation. Rehabilitation performance criteria will include post-closure land use objectives, closure objectives, landform stability targets, revegetation targets and ground water protection targets.

### 5.3 THE REHABILITATION PROCESS

Minimising environmental impacts and maximising rehabilitation success at all Robe operations is achieved by integrating the environmental aspects of each project into all stages of mine planning and through the implementation of Pilbara Iron's environmental management tools.

The PRP and operational factors for the Mesa K Remnant Mining Project will be integrated into the mine planning system. A life of Mine plan for the Pannawonica Operations is to be developed in late 2007. Operational mine plans (5 year, 2 year, Quarterly) are developed and continually updated as operations progress. The mine plans address key environmental criteria such as vegetation clearing, topsoil recovery and volumes, pit and waste dump development strategies and rehabilitation areas. Regular review through these plans and the weekly schedule provide a monitoring and feedback loop to ensure key structures are developed to design criteria. Each waste dump, for example, will have construction and rehabilitation designs developed (based on the Pilbara Iron Landform Design Guidelines) and development progress is monitored and modified as required through the planning system.

The following Pilbara Iron management tools will be implemented to ensure effective environmental and rehabilitation outcomes for the Mesa K Remnant Mining Project.

- Ground Disturbance System.  
(Requires review by relevant professionals of all areas to be disturbed, prior to disturbance.)
- Biological Survey Protocol.  
(Specifies required level of survey detail for each project area.)
- Mine Planning System.  
(Integrates and schedules key environmental aspects into mine plan.)
- Closure Planning System.  
(Details closure requirements for each site.)
- Landform Design Guidelines.  
(Specifies appropriate design criteria for landforms.)
- Soil Resource Management Plan.  
(Identifies key soil resources for recovery and rehabilitation.)
- Rehabilitation Monitoring Schedule.  
(Captures required rehabilitation monitoring.)
- Rehabilitation Handbook.  
(Outlines measures and methods for rehabilitation.)

The Pilbara Iron Environmental Management System (IEMS) is certified to ISO14001.

Objectives and preliminary targets are presented in Table 3.

**Table 3 Rehabilitation factors, objectives and preliminary targets**

<b>Factor</b>	<b>Objective</b>	<b>Preliminary target</b>
Safety	Site is safe with minimal risk to people, native fauna and livestock.	Safety measures are in place in accordance with the Mines Safety and Inspection Act (MSIA).
Post-mining landforms	Post-mining landforms are safe, stable and aesthetically compatible with the surrounding landscape.	Waste dump landforms are geotechnically stable. No requirement for intervention for management of erosion following establishment of sustainable vegetation community. Post mining landforms deemed 'acceptable' by regulatory agencies and key stakeholders.
	Post-mining landforms that minimise ponding and are non-polluting.	Waste dumps do not receive run-on from surrounding areas. Waste dumps shed water to a natural or non-erosive landform. Open pit voids retain a minimum 1 in 20 year (ARI) rainfall for settlement of suspended solids.
Hydrology	Operations designed and undertaken to minimise interference with natural surface flows within the Robe River.	No breaching of banks, excessive ponding or excessive sedimentation in adjacent Robe River as a result of operations.
Revegetation	Establishment of sustainable endemic vegetation communities consistent with reconstructed landforms, surrounding vegetation, and suitable to support the future land use.	Incorporation of rehabilitation earthworks into the greater Pannawonica rehabilitation schedule. Revegetation satisfies the predetermined post-closure criteria developed in conjunction with regulatory agencies (i.e. Species diversity, percentage cover etc)
	Weed Management.	Weed occurrences are minimised within rehabilitated areas.
Visual amenity	External visual amenity of the site is maintained to community expectations.	Southern escarpment retained. Current visual amenity from adjacent Robe River is maintained.

## 5.4 MONITORING AND MAINTENANCE

The Mesa K Project will be incorporated into the regular monitoring schedule which applies to all Robe sites. Monitoring and review of factors directly affecting rehabilitation will be undertaken through two primary mechanisms: mine planning and rehabilitation monitoring.

Operational factors will be integrated into the mine planning and scheduling system, to ensure continuous monitoring and review of progress. This will include key environmental and rehabilitation factors such as:

- safety measures in accordance with the Mines Safety and Inspection Act (MSIA)
- geotechnical review of reconstructed landform and slope stability
- review of functional surface hydrology, open pit void water retention, surface water ponding and shedding
- vegetation clearing
- topsoil recovery and stockpiling
- pit and waste dump development strategies
- open pit void backfilling
- earthworks progress for rehabilitation areas.

Regular review of these aspects through mine planning and scheduling will provide a monitoring and feedback loop to ensure key structures are developed to design criteria.

Rehabilitation monitoring will be a part of scheduled monitoring for Mesa K, commencing at the completion of rehabilitation works.

The rehabilitation monitoring program will include the following factors:

- **landform stability and erosion:** related to surface hydrology particularly with regard to surface water management on reconstructed landforms, erosion gullying, rilling, loss of surface material and factors affecting surface stability and revegetation
- **revegetation:** monitoring specific factors to gauge success and identify required remedial actions to establish sustainable native vegetation communities.

Monitoring of site rehabilitation will be undertaken to measure the progress of rehabilitation and ensure that objectives and targets are being met. Monitoring programs provide useful feedback for improvement of rehabilitation techniques, and help assess the long term success of rehabilitation. Monitoring also provides vital information to establish realistic and achievable completion criteria.

Robe has been undertaking rehabilitation monitoring since 1993, at previously mined sites in the Robe River area, including mesas J, K, L, M and N. Examples of rehabilitation monitoring photographs for Mesa K are presented in Figure 2.

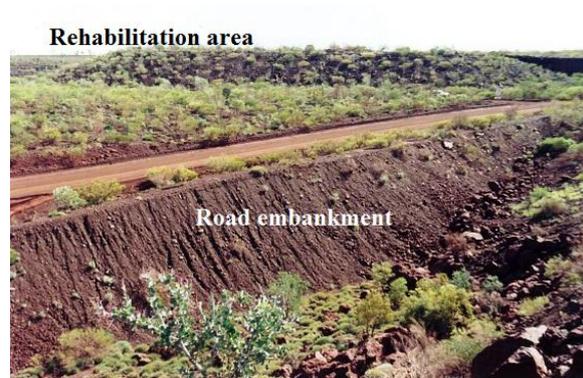
Robe's rehabilitation monitoring to date has focused on ecosystem functions, measuring parameters such as vegetation density, vegetation cover and indicators of landscape function including surface

stability, infiltration capacity and nutrient cycling capacity. Results of rehabilitation monitoring are reported in Robe's Annual Environmental Report.

Revegetation monitoring will be undertaken to ensure that vegetation communities are approaching the planned land use values for the area. In general, vegetation is monitored to assess and compare composition, structure and function of the revegetated area to an adjacent control area. Control areas are permanent reference sites selected on the basis of representative landform and vegetation applicable to each of the land systems to be restored. These sites help to account for changes in seasonal or inter-annual changes in ecosystem state and represent a potential end point for rehabilitated landscapes.



(a) Rehabilitation monitoring area K31 at Mesa K 1996



(b) Rehabilitation monitoring area K31 at Mesa K 2005



(c) Rehabilitation monitoring area K1 at Mesa K 1994



(d) Rehabilitation monitoring area K1 at Mesa K 2001

**Figure 2** Examples of rehabilitation monitoring at Mesa K

Monitoring of operational aspects, during operation, will allow defects and variations to design to be quickly identified and rectified. This is important for key activities such as waste dump development and open pit void backfilling, and will help ensure final landforms are appropriate and require minimum reworking.

Monitoring the rehabilitated areas, following operations, will ensure that any areas requiring remedial work are identified. Rectification and maintenance works will be undertaken as necessary and may include:

- minor earthworks
- erosion control works
- reseedling
- weed control.

A detailed site specific monitoring schedule will be developed for the Mesa K Remnant Mining Project and rehabilitation.

## **5.5 REPORTING**

Detailed records of the planning and rehabilitation processes will be maintained for key rehabilitated areas and will include:

- landform design and surface rehabilitation treatment
- rehabilitation earthworks
- seed selection, treatment and province
- seed application rates and methods
- progressive revegetation results
- photographic monitoring records.

The progress of rehabilitation and revegetation will be reported in the Annual Environmental Report, which is currently submitted to regulatory agencies for review.

## **5.6 REVIEW AND REVISION**

The PRP shall be reviewed and revised as required throughout the duration of the proposal to incorporate progress or changes that may be necessary to achieve the designated performance targets, changes to the mine plan and/or new information regarding improvements in rehabilitation techniques. Upon review, the PRP shall be revised and re-issued where appropriate. DEC and DoIR will be advised of any minor revisions to the PRP, however, major revisions will be undertaken in consultation with DEC and DoIR.

## **5.7 REHABILITATION PERFORMANCE**

Robe aims to rehabilitate all areas of land that it disturbs during the course of carrying out its operations. Robe's environmental performance in rehabilitation has been widely recognised, and in 1997 the company was awarded a certificate of merit in the Golden Gecko Awards for mine site rehabilitation work conducted at Mesa K.

Robe has participated in a number of studies, in conjunction with universities and research organisations, in order to improve rehabilitation techniques in the Pilbara region. Projects have

included for example: trials to maximise spinifex regrowth<sup>1</sup>; establishment of a native seed farm; and the use of remote sensing data to monitor the performance of rehabilitation areas.

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<sup>1</sup> Spinifex establishment has improved with each rehabilitation program in the Robe Valley due to the increased knowledge obtained through research programs, for example additions of greater volumes of spinifex to the seed mix and improved pre-treatment practices. The improvement is demonstrated by the substantial population of spinifex on the youngest rehabilitation which is located on Mesa J.

## 6. REHABILITATION MEASURES

Rehabilitation of the Mesa K Remnant Mining Project will be undertaken in accordance with statutory and corporate guidelines and requirements as previously outlined. The rehabilitation program will be managed through the implementation of the key components of the rehabilitation process as outlined in Section 5.2.

### 6.1 GENERAL REHABILITATION MEASURES

General rehabilitation measures which will be applied across the site are outlined here, with information on more specific areas provided in the following section.

Following the completion of mining, expected 2010 – 2011, disturbances across the site will be made safe and rehabilitated. The general measures to be implemented across the site are briefly summarised below.

- Safety bunds will be constructed around each pit void.
- Access roads to pit voids and other access roads no longer required will be blocked and rehabilitated.
- Minor excavations will be backfilled and rehabilitated.
- Rubbish and scrap will be removed and disposed of at the Mesa J and townsite landfill as appropriate, or buried as appropriate.
- Drill holes not required for ongoing monitoring will be plugged below ground level and rehabilitated.
- Exploration disturbances will be rehabilitated in accordance with the Pilbara Iron Exploration Rehabilitation procedure.
- Following demolition, clean up and re-profiling of disturbed surfaces and landforms, stockpiled topsoil will be re-spread and deep ripped on the contour.
- Vegetation recovered during pre-stripping will be applied with topsoil to rehabilitation surfaces.
- Seed sourced from within the designated Mesa K provenance zone will be applied to rehabilitation areas at the specification of the Environmental Advisor - Rehabilitation.

#### 6.1.1 Weed control

Weed occurrences have been identified and mapped as part of the Mesa K vegetation survey. The vast majority of weed records were associated with the Robe River, or the adjacent floodplain. Few occurrences of weeds are located within the areas proposed to be disturbed by this project.

Weed occurrences will be controlled by undertaking weed spraying programs prior to any disturbance occurring at the site. These control measures will specifically target, as a priority, those areas which are to be disturbed in the course of this project. The broader occurrences of weeds in and around Mesa K will be controlled as part of the annual weed control program.

Weed control measures will be implemented in accordance with the Pilbara Iron Weed Management Plan and equipment hygiene controls will be implemented in accordance with the Pilbara Iron Weed Hygiene Procedure.

### 6.1.2 Soil resource management

Vegetation, where present, will be recovered with soil material from all areas to be disturbed and re-used on rehabilitation areas.

Topsoil is a very limited resource within the Mesa K Remnant Mining Project area due to both the nature of the mesa surface and also due to the fact that the current operation will be located primarily within previously disturbed areas.

Topsoil will be stockpiled separately and will be located within existing disturbance areas wherever possible, ready for later re-use. Topsoil management will be undertaken in accordance with the Rio Tinto IEMS Soil Resource Management Procedure.

#### *Undisturbed areas*

In undisturbed areas of Mesa K the topsoil is thin with rocky outcrops. It is anticipated that approximately 100 mm will be recovered from these areas; however, more topsoil will be recovered where it is available. Where possible, material deeper than 200 mm will be recovered as subsoil for reuse in revegetation.

#### *Revegetated areas*

Where revegetated areas are to be disturbed, the vegetation will be removed and stockpiled together with suitable soil material for later re-use, wherever this is suitable. This will be implemented wherever appropriate, such as within the floor of the West-North pit and parts of the current surface of the Gravel Yard pit. Most of the previously rehabilitated areas at Mesa K did not receive topsoil; however, vegetation, a soil seed bank and leaf litter has subsequently accumulated in these areas. Vegetation and developing topsoil (approximately 100 mm or more if it is available) will be recovered from these areas for use in rehabilitation.

Topsoil will not be recovered from existing disturbed (not rehabilitated) areas or areas where steep topography prevents recovery.

#### *External soil sources*

Topsoil material may become available for use at Mesa K from nearby development sites in the near future. Potential impacts associated with sourcing external material include introduction of weeds and non-endemic species. However, any external topsoil and subsoil materials used at Mesa K will be sourced from the same land system and vegetation types present at Mesa K. All rehabilitation sites are regularly monitored for parameters such as weeds, vegetation establishment and nutrient cycling capacity (Section 5.4).

### 6.1.3 Demolition

Robe has decided to operate the Mesa K Remnant Mining Project as a satellite project to Mesa J. This will avoid the need for substantial infrastructure at the Mesa K site. Infrastructure will be limited to transportable offices, lunch room, toilet and portable generators.

All facilities will be removed and re-used or appropriately disposed of at Mesa J or Pannawonica town facilities.

The septic system will be emptied by a licensed contractor and the septic waste will be appropriately disposed of to a licensed facility. The septic structure will be backfilled, buried in situ and revegetated.

### 6.1.4 Clean-up and remediation

Bulk fuel and bulk chemicals (other than explosive materials) are not planned to be stored at Mesa K as part of this project. These materials will be sourced from existing facilities at the Mesa J site. As such, the only potential for contaminated materials will be from in-pit refuelling.

Any hydrocarbon contaminated soil materials will be recovered and remediated at the designated remediation area at Mesa J.

## 6.2 AREA SPECIFIC REHABILITATION AND CLOSURE MEASURES

General rehabilitation measures to be applied to all areas are described in the preceding section.

Specific strategies and rehabilitation measures requiring further discussion are outlined in this section. These strategies are specific to Mesa K and have been developed and adopted to minimise further disturbance, preserve environmental values and maximise rehabilitation success.

Figure 3 shows the conceptual site layout and main rehabilitation structures, including waste dumps, low grade ore stockpiles and pit void backfill areas. The locations and configuration of proposed infrastructure, stockpiles and waste dumps may vary due to operational changes.

### 6.2.1 Void backfilling strategy

Limited waste material will be generated during the operation of the Mesa K Remnant Mining Project. The waste volume available will not be sufficient to backfill all pit voids. A selective void backfilling strategy has been developed to maximise the environmental benefits of backfilling, within the constraints of safe practicable mining. The key outcomes from the backfilling strategy are summarised below.

- Backfilling of the Central Pit void, to marry into the surrounding mesa surfaces and the adjacent Echo and Foxtrot waste dumps.
- Backfilling of previously mined voids with the Hotel, and possibly India waste dumps, to marry into the surrounding mesa landscape.
- Backfilling of the southern leg of the Gravel Yard pit void, to blend this leg into the surrounding mesa surface.
- Development of the Bravo and Delta waste dumps, to blend into sections of the surrounding mesa surface, and remain below the visual profile of the mesa crest.

- Partial backfilling of sections of the Gully pit void.
- Expansion of the existing Alpha waste dump, if practical, to allow the external un-rehabilitated waste slope to be re-profiled to 20° and rehabilitated.
- Depths of the remaining open pit voids will vary in the approximate range of 20-35m below the surrounding surface.

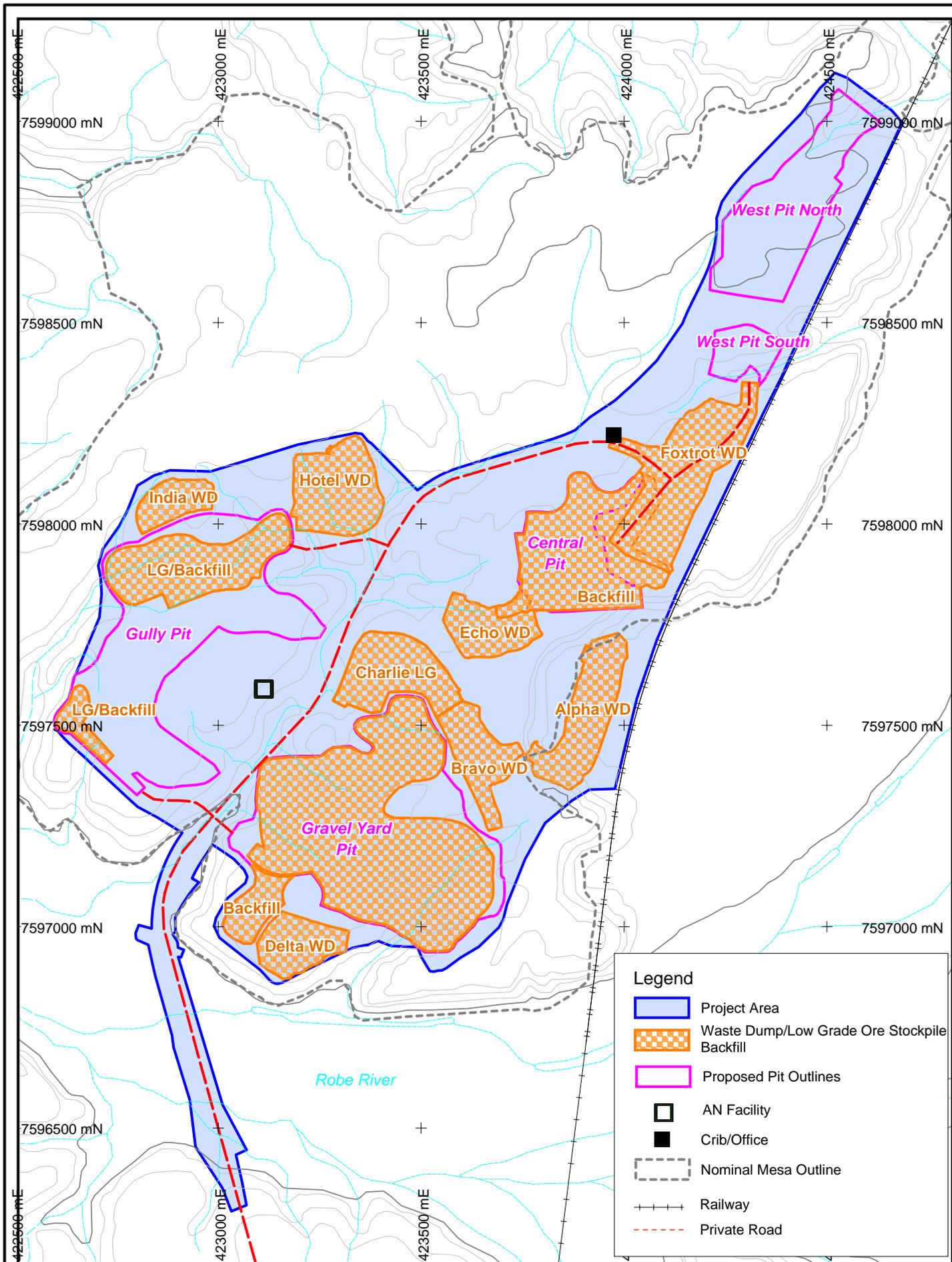


Figure 3 Mesa K Conceptual Rehabilitation areas

## 6.2.2 Waste dump rehabilitation

The deposition of waste rock materials has been designed to maximise backfilling and avoid new disturbance as outlined above.

Where waste dumps are not a complete void backfill, and thus have an external slope they will be designed in accordance with the Pilbara Iron Landform Design Guidelines (Pilbara Iron 2007). The design incorporates rehabilitation design, to optimise the configuration and stability of waste dumps to facilitate successful rehabilitation, and to minimise waste rehandling. Waste dump slopes will be profiled to a batter slope of 20 degrees.

Waste dumps are located wholly within areas previously disturbed by mining, with the exception of the Alpha waste dump which encroaches on a small area only partly disturbed. The Alpha dump is situated on top of a previously developed waste dump, which could not previously be rehabilitated due to safety concerns. Dumping additional waste rock in this location, if practical, will enable an improved landform to be constructed with the slope reduced, and thus will allow for the landform, to be rehabilitated.

The waste dumps have been designed to address legacy issues from historical mining wherever possible, as in the case of Echo, Hotel and India (contingency) waste dumps, which provide for backfilling of previous voids.

Dump heights are designed to be no higher than the adjacent natural topography.

Where waste dumps abut natural landscapes, they are designed to blend with the adjacent topography, and to prevent surface runoff from the adjacent landform flowing onto the waste dump top. The tops of the waste dumps will be sloped towards natural topography and/or towards the centre of the dump. A bund wall will be constructed around the dump crest to prevent surface water flowing over the edge.

Mesa K waste and ore materials are classified as low erodibility. These materials are non-friable and perform well on rehabilitation surfaces.

A risk assessment for Acid Rock Drainage (ARD) potential has been undertaken for Mesa K. The total materials to be mined with sulphur concentrations above 0.1% (Sulphur > 0.1%) is very low, including both waste and low grade ore. The potential ARD risk of the Mesa K Remnant Mining Project is low, and is not considered to require special management

## 6.2.3 Low grade ore stockpiling strategy

Approximately 5.4 Million tonnes of low grade ore material is expected to be produced during the operation of the Mesa K Remnant Mining Project. It is the preferred strategy to cart as much of this ore directly to Mesa J for blending. However, the volume of low grade ore which can be directly hauled to Mesa J will depend on many factors including the quality, blending and scheduling requirements. As such it is necessary to provide for stockpiling of low grade ore within the Mesa K project site.

Low grade ore stockpiling will be primarily located within the Gravel Yard pit void and Gully pit void to avoid unnecessary further disturbance.

Low grade ore will be recovered from the stockpiles and hauled to Mesa J as required throughout the operation period. It is expected that required low grade ore will be recovered into 2011. Any low grade ore material not recovered will be treated as waste material. That is, the stockpile will be re-profiled and rehabilitated in the same manner as a waste dump, and in accordance with the Pilbara Iron Landform Design Guidelines and Rehabilitation Handbook.

#### **6.2.4 Pit void rehabilitation**

Following the completion of mining, pit voids will be made safe, access will be blocked and the pit floors will be contour ripped and seeded. Where topsoil, is available, it will be used. Pit access roads will be rehabilitated when no longer required.

#### **6.2.5 Timing of rehabilitation**

The Mesa K Remnant Mining Project is planned to be operated from 2008 through to 2010 (possibly extending into 2011). The mine schedule provides for the eastern pits to be mined during 2008-9, with the Gully pit being mined 2009-2010.

Preliminary rehabilitation works required to ensure safety of the site will be undertaken during and immediately following the completion of mining. Final rehabilitation and revegetation works will be undertaken on a campaign basis at Mesa K as described below.

Pit void backfilling will commence in 2008 and will continue throughout the operation period. The Central pit void and Echo and Foxtrot dumps will be completed in 2010, and surface rehabilitation works on these landforms will commence in 2011.

Backfilling and construction of all other waste dumps is expected to be completed in 2010 (possibly extending into 2011). Surface rehabilitation and revegetation works will commence in these areas in 2012.

General rehabilitation works will be undertaken commencing in 2011, but will not be complete until all major works are finished, allowing for final re-profiling and rehabilitation of access tracks and minor disturbances.

Recovery of low grade ore stockpiles may continue into 2011. The extent of recovery of these materials will be regularly reviewed. Low grade ore materials remaining in place will be treated as waste dumps, re-profiled and rehabilitated accordingly.

Pit floors are planned to be rehabilitated in 2012-2013.

The majority of rehabilitation works are expected to be undertaken in 2011-2012. Minor rehabilitation works may continue into 2013. Rehabilitation earthworks are therefore expected to be completed in 2013. Ripping and seeding of completed landforms is planned to be progressively undertaken as landforms are completed, commencing in 2011.

Monitoring will continue for several years following the completion of rehabilitation until a safe and stable landform is present which supports self-sustaining native vegetation communities.

## 7. REFERENCES

- Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (ANZECC/ARMCANZ) 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, National Water Strategy, Canberra.
- Australian and New Zealand Minerals and Energy Council (ANZMEC) and Minerals Council of Australia (MCA) 2000, *Strategic Framework for Mine Closure*, National Library of Australia Catalogue.
- Chamber of Minerals and Energy of Western Australia Inc. 2000, *Mine Closure Guidelines for Mineral Operations in Western Australia*, October 2000.
- Collie, Paul 2007, Pers. Comm. Pilbara Iron Environmental Specialist.
- Department of Environment 2003, *Contaminated Sites Management Series: Assessment Levels for Soil, Sediment and Water*, Version 3, November 2003.
- Department of Industry, Tourism and Resources (DITR) 2006, *Leading Practice Sustainable Development Program for the Mining Industry. Mine Rehabilitation*.
- Department of Minerals and Energy (undated), *Guidelines for Waste Dump Design and Rehabilitation*.
- Department of Minerals and Energy 1996, *Guidelines for Mining in Arid Environments*.
- Department of Minerals and Energy 1996, *Guidelines on the Safe Design and Operating Standards for Tailings Storage*.
- Department of Minerals and Energy 1997, *Guidelines on Safety Bund Walls around Abandoned Open Pits*.
- Department of Minerals and Energy of Western Australia 1997, *Guideline Safety Bund Walls Around Abandoned Open Pit Mines*.
- Environment Australia (EA) 1998, *Best Practice Environmental Management in Mining – Landform Design for Rehabilitation*.
- Environmental Protection Authority 2006, *Guidance for the Assessment of Environmental Factors: Rehabilitation of Terrestrial Ecosystems*. Draft No. 6.
- Jones, H. 2004, *Landform Evolution*, Australian Centre for Geomechanics. Paper from the Conference on Mine Closure: Towards Sustainable Outcomes.
- MBS Environmental 2006, *Jack Hills Project, Murchison Region, Western Australia: Environmental Protection Statement*.
- Minerals Council of Australia 1998, *Mine Rehabilitation Handbook*.
- Minerals Council of Australia 1999, *Mine Closure Policy*.

Minerals Council of Australia 2000, *Australian Minerals Industry (AMI) Code for Environmental Management*.

Pilbara Iron 2004, *Iron Environmental Management System, Rehabilitation Handbook*.

Pilbara Iron 2005, *Iron Environmental Management System, Soil Resource Management Plan*.

Pilbara Iron 2005a *Greater Pannawonica Operations Closure Study*.

Pilbara Iron 2006, *Iron Environmental Management System, Pilbara Iron Environmental Policy*.

Pilbara Iron 2007, *Iron Environmental Management System, Pilbara Iron Landform Design Guidelines*.

Tongway D. 1994, *Rangeland Soil Condition Assessment Manual*, CSIRO Division of Wildlife and Ecology, Canberra.

Ward 1995, *Best Practice Environmental Management in Mining - Rehabilitation and Revegetation*, Commonwealth Environmental Protection Agency.