1. Introduction

The primary objective of the Mungada Ridge Hematite Project is to mine, process and transport iron ore on a profitable basis within the project's environmental and social objectives.

1.1 Overview

Karara Management Services Pty Ltd (KMS), a wholly owned subsidiary of Gindalbie Metals Ltd (Gindalbie), is proposing to develop the Mungada Ridge Hematite Project. The project will be located in the Mid-West Region of Western Australia, approximately 225 km east-southeast of Geraldton and 400 km north-northeast of Perth (Figure 1.1).

The proposed minesite is a greenfield site with an estimated resource of approximately 22.8 Mt, with additional resources expected following further resource definition. The ore will be mined over an estimated project life of 10 years. The project will comprise the development of six open pits, on-site crushing and screening, waste rock dump construction and the construction of an accommodation village, administration building and workshop at the minesite. Quadruple road trains will transport the ore from the minesite to a rail siding located approximately 3 km north-northeast of the town of Morawa. Office and workshop facilities will also be located at the rail siding. From the rail siding the ore will be transported to the Port of Geraldton via the existing WestNet Rail network, prior to export by ship to international markets.

1.2 Background

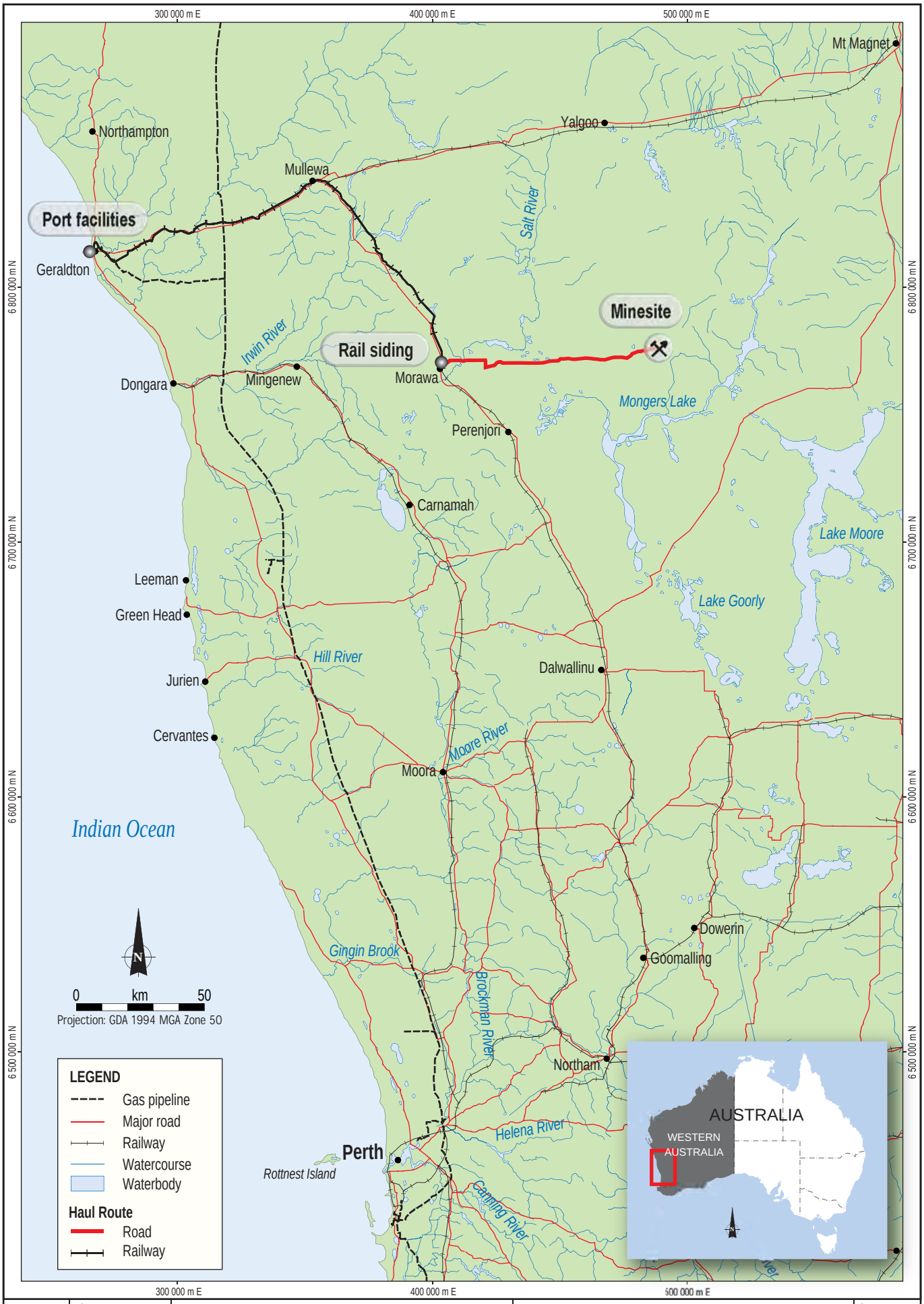
The project area was originally explored and mined by Western Mining Corporation (WMC) between 1962 and 1973. During this period, WMC commenced mining of two open pits, known as Mungada and Mungada West, to complement the ore being extracted from their Koolanooka operation, and identified the Mungada Ridge hematite deposits, the Karara magnetite deposit and several other areas of iron enrichment.

Gindalbie acquired the tenements covering the Mungada Ridge hematite deposit (and the Karara magnetite deposit) in 2002 and has since conducted an extensive exploration program. By 2006, sufficient resources had been identified to undertake a feasibility study and to commence the project environmental approvals process.

1.3 Project Objectives

The primary objective of the Mungada Ridge Hematite Project is to mine, process and transport iron ore on a profitable basis. This will be achieved within the project's environmental and social objectives, which are to:

- Plan, construct, operate and decommission the project in a manner that is consistent with good industry practice and in compliance with the conditions and standards prescribed by the Western Australian Government and, where applicable, the Commonwealth Government.
- Develop the project in a climate of public participation and support and in a manner that maximises positive impacts and minimises adverse impacts.



enesar	Job No: we08009	Karara Management Services Pty Ltd	Project location	Figure No: 1.1
	File No: 8009_09_F01.01_HB	Mungada Ridge Hematite Project		

1.4 Project Proponent

1.4.1 Karara Management Services Pty Ltd

KMS (ACN 118 832 474) is the proponent for the Mungada Ridge Hematite Project. KMS is a wholly owned subsidiary of Gindalbie Metals Ltd (Gindalbie). KMS will develop, manage and operate the Mungada Ridge Hematite Project in a 50:50 share agreement with Anshan Iron and Steel Group Corporation (AnSteel).

The proponent contact details are provided in Table 1 .1.

Table 1.1 Proponent contact details

Karara Management Services Pty Ltd
Physical Address
Level 9, London House
216 St Georges Terrace
Perth, Western Australia, 6000
Postal Address
PO Box 7200, Cloisters Square
Western Australia, 6850
Key Contact
Contact: Greg Kaeding
Community Relations and Environment Manager
Telephone: +61 8 9480 8700
Facsimile: +61 8 9480 8799
greg.kaeding@gindalbie.com.au

1.4.2 Gindalbie Metals Ltd

Gindalbie (formerly Gindalbie Gold NL) was first listed on the Australian Stock Exchange in April 1994, rapidly establishing itself as a successful minerals explorer and producer.

As part of an expansion of ground holdings in the region of its Minjar gold mining operations during 2002 and 2003, Gindalbie acquired 100% ownership of the tenements containing the Mungada Ridge hematite and Karara magnetite deposits. Recognising the significant potential of the iron ore mineralisation contained within the tenements, Gindalbie underwent a strategic shift in focus to emerge as a dedicated iron ore exploration and development company.

1.4.3 Anshan Iron and Steel Group Corporation

AnSteel was first established within the Liaoning Province of China in 1916. AnSteel was listed as China's second largest, and the world's eighth largest, steel producer in April 2006. In 2004, AnSteel's crude steel production was 11.3 Mt with annual sales revenue in excess of US$8 billion. In 2006, AnSteel's crude steel production was in excess of 15 Mtpa.

In the second half of 2006, AnSteel announced a merger with Benxi Steel (BenSteel), also based in Liaoning Province. When the merger is complete, the two companies will operate under the name of Anben Steel Group Company (Anben). Anben is expected to have a total steel production capacity of 30 Mtpa by 2010.

Under current Chinese Central Government policies, AnSteel is considered to be one of the country's key growth companies and has strong support in securing new sources of long-term iron ore supply through international investment. AnSteel reports that it has financial support for its investments from the China National Development Bank.

1.5 Document Purpose and Structure

On 24 April 2006, the Environmental Protection Authority (EPA) advised that the level of assessment for the Mungada Ridge Hematite Project was set as Public Environmental Review (PER).

This document has been prepared in accordance with the requirements of Part IV, Division 1, of the *Environmental Protection Act 1986* (EP Act) for proposals of local or regional significance that raise a number of significant environmental factors, some of which are considered complex and require detailed assessment. The EPA dictates that such proposals should be subject to a formal public review period and the setting of environmental conditions under Part IV of the EP Act to ensure the proposals are implemented and managed in an environmentally acceptable manner.

This documents fulfils the requirements to prepare a PER as outlined in the EPA guidelines (EPA, 2006a). Further, its structure and content are aligned with the objectives of the EPA guidelines.

Those objectives are provided in Box 1.1.

Box 1.1 EPA Guidelines for PER objectives

- Place the project in the context of the local and regional environment
- Describe all components of the project.
- Provide the basis for the project environmental management program, outlining how environmental impacts resulting from the proposed project, including cumulative impacts, will be minimised and acceptably managed.
- Communicate clearly with stakeholders (including the public and government agencies), so that the EPA can obtain informed comment to assist in providing advice to government.
- Demonstrate why the project should be judged by the EPA and the Minister for the Environment to be environmentally acceptable.

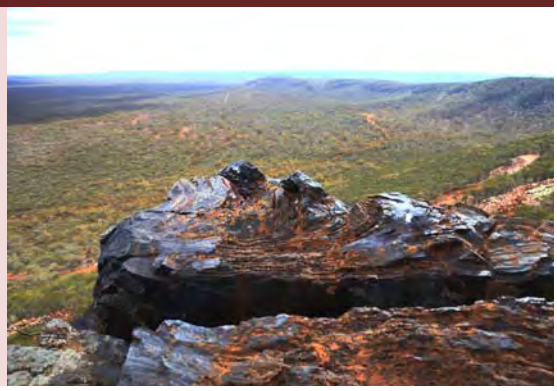
Table 1.2 provides the structure of the PER.

Table 1.2 PER structure

Part	Overview of contents
Main Report (Volume 1)	Intended to be understood without reference to supporting technical reports.
Executive Summary	Provides a summary of the project.
Chapter 1	Background, project history, project objectives, project proponent and document purpose and structure.
Chapter 2	Description of the Australian iron ore industry, the rationale for development and the project benefits.
Chapter 3	Legislative framework and approvals process the project is required to undertake to obtain environmental approval.
Chapter 4	Description of stakeholder consultation undertaken to date and proposed ongoing consultation program.
Chapter 5	Description of the environmental and social context of the project area
Chapter 6	Detailed description of the proposed project.
Chapter 7	Assessment of the existing environment, potential impacts, avoidance, mitigation and management measures and residual impacts.
Chapter 8	Description of the principles of environmental protection and sustainability, the environmental management framework for the project and proposed offsets.
Chapter 9	Summary of the environmental management commitments.
Chapter 10	Details of the study team.
Chapter 11	References.
Chapter 12	Glossary.
Appendices (Volumes 2 to 5)	A series of supporting technical studies, the content of which is summarised in the main report.
Volume 2	Appendices 1 – 5: Soil and Water
Volume 3	Appendices 6 – 8: Fauna
Volume 4	Appendices 9 – 14: Flora
Volume 5	Appendices 15 – 18: Air, Noise, and Cultural Heritage
Supplementary Information	Flora and Fauna Environmental Management Plans, Conceptual Mine Closure Plan and Annual Spring Flora Survey.

2. Project Rationale

The iron ore resources sector in Western Australia is recognised as a crucial driver of state economic development and a major contributor to the national economy.



2.1 Australia's Iron Ore Industry

Today, Australia is the third largest producer of iron ore, behind China and Brazil, accounting for approximately 17% of the world's production (DoIR, 2007). Australia is the world's largest exporter of iron ore; the product is exported primarily to major steel producers in Northeast Asia and Western Europe (DoITR, 2006). Australia maintains a major advantage over its main competitors through large, high-quality, accessible deposits, a stable legal and political environment, and proximity to major markets in Northeast Asia (DoITR, 2006).

The iron ore resources sector in Western Australia is recognised as a crucial driver of state economic development and a major contributor to the national economy. Over the 2005/06 financial year, operating iron ore mines employed approximately 15,000 people in Western Australia (DoIR, 2007). In the same financial year, royalties paid to the state government from iron ore production totalled $680 million (DoIR, 2007).

Western Australia's first commercial export of iron ore was in 1966 from WMC's Koolanooka Hills Mine in the Mid-West Region, approximately 65 km west of the proposed Hematite Project minesite. Ore mined from Koolanooka Hills was transported by rail to Geraldton for export to Japan.

In 2005, the Western Australian iron ore industry produced over 250 Mt of iron ore, accounting for 98% of Australia's production (DoIR, 2007).

Production was predominantly driven by high demand from China's rapidly growing steel industry. It is estimated that demand for iron ore will continue to increase and will drive the Western Australia iron ore industry to produce as much as 520 Mt by 2015 (Webb, pers. com., 2006).

In Western Australia, the majority of the iron ore resources are within the Hamersley Basin located in the Pilbara Region. Deposits are also located within the Mid-West Region (Yilgarn) and the West Kimberley (Yampi Sound) and near the south coast (Southdown). The Pilbara Region is predicted to remain the largest iron ore producing region in Western Australia (with a predicted output of 340 Mtpa), and the Mid-West Region is predicted to become the second largest Western Australian iron ore producing region (with a predicted output of 75 to 80 Mtpa from a defined resource worth over $70 billion) (Webb, pers. com., 2006). This resource is likely to increase with continued exploration.

Exports from new iron ore mines in the Mid-West Region are needed to meet growing global demand.

2.2 Rationale for the Development

In February 2005, Gindalbie entered into an agreement with AnSteel to jointly investigate the feasibility of the Karara Iron Ore Project (comprising the Mungada Ridge Hematite Project and the Karara Magnetite Project), with the objective of supplying iron ore products to the expanding steel-making capacity of AnSteel in China.

AnSteel is developing a new, fully integrated 5 Mtpa steel works at the Port of Bayuquan, at the city of Yingkou, on the northeast coast of China, in addition to significantly enhancing the operational performance of its current steel works at Anshan City, 100 km inland from Yingkou.

The Karara Iron Ore Project development by KMS on behalf of Gindalbie and AnSteel is driven by three major factors:

- The Chinese steel industry which is rapidly expanding in response to demand from sustained economic growth within China, as well as demand from international export markets for steel.
- AnSteel's desire to diversify the supply of iron ore to its steel-making facilities.
- The desire to develop a long-term, reliable customer/supplier relationship with a strategic partner; Australia offers the lowest sovereign risk and highest quality product at the most effective shipping distance from China.

The Mungada Ridge Hematite Project will initially supply 1.5 Mtpa of hematite direct shipping product to AnSteel in China. Production is expected to increase to 3 Mtpa by 2009. It will also enhance the ability of KMS to deliver the Karara Magnetite Project by:

- Enhancing the understanding of the iron mineralisation in the region.
- Developing the initial infrastructure to the area including roads, communication and accommodation facilities.
- Improving the understanding and stewardship of the environmental and conservation values and management practices of the area, prior to the larger-scale second phase of the project.

2.3 Benefits of the Proposal

ACIL Tasman Pty Ltd (ACIL Tasman) has assessed the socio-economic impacts of the proposal. This assessment included a review of the positive and negative potential impacts on the socio-economic environment, at the regional, state and national levels, the details of which are presented in Section 7.11.

This section summarises the key socio-economic benefits that are predicted to result from the proposed development.

2.3.1 Employment

Construction will require a workforce of approximately 200 people. Most personnel will be based in Perth and employed on a fly in, fly out (FIFO) basis. KMS will also support any personnel who choose to be based in Perenjori, Morawa or Geraldton. In addition, the project will have a flow-on effect and boost indirect employment in the businesses that provide goods and services to the construction phase.

The project is predicted to result in the creation of around 420 to 480 direct or indirect full-time equivalent jobs in the Mid-West Region. During operations, it is anticipated that 200 people will be employed directly by the project plus up to an additional 30 people during periods of maintenance shutdown. It is anticipated that additional indirect employment will be created as a result of the project, particularly in the goods and service supply businesses that will be required to support the mine and its workforce.

2.3.2 Gross State and Regional Product

Economic modelling predicts that, during the construction phase, the Gross Regional Product (GRP) for the Mid-West Region will rise by an estimated $15 million for that financial year. For Western Australia as a whole, the rise in Gross State Product (GSP) is estimated to be $0.7 million for the same period.

During the operations phase, the Mid-West GRP is predicted to rise by between $110 million and $156 million per year when the project is operating at full production. The GSP for Western Australia is estimated to rise by between $75 million and $100 million per year. Over the life of the project, private consumption is estimated to increase up to $26 million in the Mid-West Region and an additional $8 million in other areas of Western Australia, in any one year over the life of the project, when operating at full production.

2.3.3 Economic Diversity

At the local level, the development will broaden the economic base of the shires of Perenjori and Morawa, which currently rely predominantly on the agricultural industry with few alternative employment opportunities. The proposed development will broaden business and employment opportunities in the Mid-West Region and will diversify the state's industrial and economic base away from the Perth Metropolitan, Goldfields, South West and Pilbara regions.

2.3.4 Government Revenue

Revenue to local shires will increase marginally for example, increases in rate revenue arising from new local housing development. The key revenue benefits are at the state level, with the Western Australian Government likely to receive in the order of between $10 million and $11 million per annum in royalties. This is based on an annual production of 3 Mtpa of lumps and fine ore at an approximate value of $60 per tonne, a payroll tax of around $1.3 million per annum, and payment of other state taxes and charges.

The Commonwealth Government will also receive a boost to revenue primarily in the form of company taxes, income taxes, and goods and services tax (GST).

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3. Legislative Framework and Approvals

The EPA has the broad objective of protecting the State's environment. It provides overarching environmental advice to the Minister for the Environment through the preparation of environmental protection policies and the assessment of development proposals and management plans, as well as providing public statements about matters of environmental importance.

3.1 Western Australia

3.1.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) is the primary legislation that governs environmental impact assessment and protection in Western Australia. Approvals can be required under two parts of the EP Act: Part IV and Part V. Projects that have the potential to have significant environmental impacts are assessed under Part IV, while prescribed premises (as listed under Schedule 1) must be approved under Part V. The Mungada Ridge Hematite Project requires both Part IV and Part V approvals.

Part IV

The *Environmental Impact Assessment (Part IV, Division 1) Administrative Procedures 2002* (the Administrative Procedures) set out the procedures adopted by the EPA for assessment of proposals referred under Part IV, Division I, of the EP Act. Under these procedures, the EPA can adopt one of five levels of assessment for a proposal. The level of assessment is determined by the potential for environmental impacts and the likelihood of public interest in the project activities. The EPA descriptions of the levels of assessment are provided in Box 3.1.

Box 3.1 EPA levels of assessment

Assessment on Referral Information (ARI): This level of assessment will typically be applied to proposals which raise one or a small number of significant environmental factors which can be readily managed, but where it is considered that environmental conditions under Part IV of the Act are required to ensure the proposal is implemented and managed in an environmentally acceptable manner, and this cannot be appropriately achieved through conditions set by decision-making authorities.

Environmental Protection Statement (EPS): This level of assessment will typically be applied to proposals of local interest that raise a number of significant environmental factors which can be readily managed, where it is considered that environmental conditions under Part IV of the Act are required to ensure the proposal is implemented and managed in an environmentally acceptable manner, and where in the judgement of the Authority, a formal public review period may be unnecessary because the proponent has adequately consulted with stakeholders.

Public Environmental Review (PER): This level of assessment will typically be applied to proposals of local or regional significance that raise a number of significant environmental factors, some of which are considered complex and require detailed assessment to determine whether, and if so how, they can be managed. The EPA considers that such proposals should be subject to a formal public review period, and the setting of environmental conditions under Part IV of the Act to ensure they are implemented and managed in an environmentally acceptable manner.

Environmental Review and Management Program (ERMP): This level of assessment will typically be applied to proposals of State interest that raise a number of significant environmental issues, many of which are considered to be complex or of a strategic nature, and require substantial assessment to determine whether, and if so how, they can be managed in an acceptable manner. The EPA considers that such proposals should be subject to extensive public review.

Proposal Unlikely to be Environmentally Acceptable (PUEA): When some proposals are referred to the EPA it will rapidly become evident during examination of the proposal that it cannot meet the EPA's environmental objectives. This level of assessment will apply to proposals that are clearly in contravention of established or applicable environmental policy, standards or procedures, could not be reasonably modified to meet the EPA's environmental objectives, or are proposed in a special environmental area.

Source: EPA (2002).

On 24 April 2006, the EPA determined that the required level of assessment for the Mungada Ridge Hematite Project is PER. An outline of the approval process for projects with a PER level of assessment is provided in Figure 3.1.

An Environmental Scoping Document outlining the proposed scope of works for the environmental and social impact assessment studies was submitted as a draft to the EPA in June 2006. Approval of this Environmental Scoping Document was received at the end of October 2006.

This PER document outlines the potential environmental impacts that may occur as a result of the construction and operation of the project and details the management measures that will be put in place to avoid or minimise these impacts. Once the EPA is satisfied that this document has adequately addressed the environmental factors and studies identified in the Environmental Scoping Document, it will be released for public review for a period of four weeks. At the conclusion of the review period, the proponent is required to summarise the pertinent issues raised in submissions made to the EPA and to respond to the issues to the satisfaction of the EPA (EPA, 2002).

In preparing a report and recommendations for the Minister for the Environment, the EPA will assess the PER document, public submissions and the proponent's response to submissions. The EPA will also obtain advice from any other persons or decision-making authorities considered appropriate in assessing the project. The EPA report is publicly available on the EPA website via an EPA Bulletin, and public or proponent appeals on the content of the report can be made within 14 days of the EPA Bulletin being published.

The final decision on project approval and conditions lies with the Minister for the Environment. The Minister may consult with other decision-making authorities on the draft conditions before granting project approval and setting conditions for approval. The proponent has 14 days to appeal the conditions set.

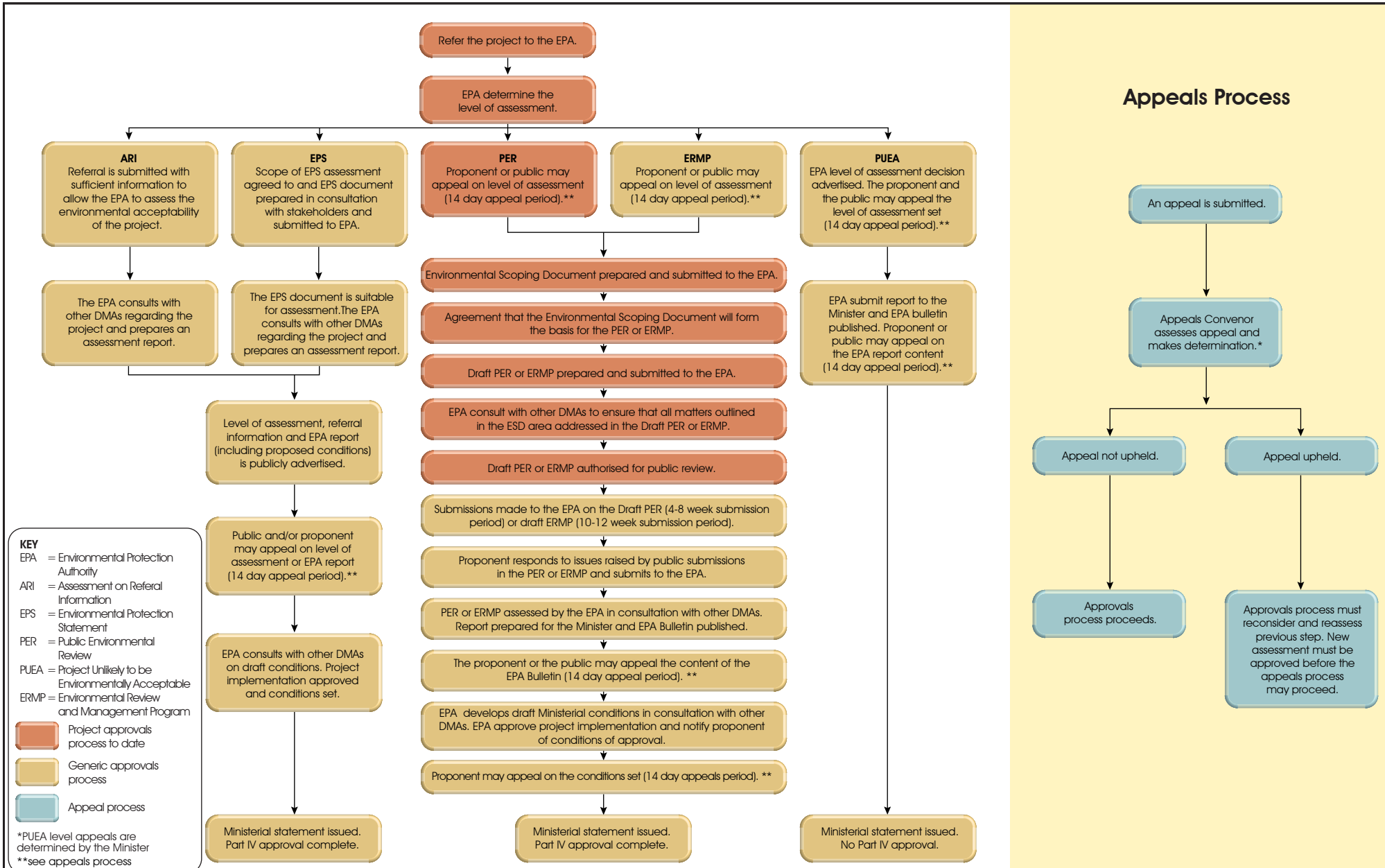
The Minister's decision is set out in a Ministerial Statement, which includes approval conditions, at which time the project may commence, subject to approvals required by other laws and regulations.

Part V

Under Part V of the EP Act, any Prescribed Premise requires a Works Approval from the Department of Environment and Conservation (DEC) before construction can commence. Some examples of Prescribed Premises within the project are:

- Processing or beneficiation of metallic ore.
- Sewage facility.
- Putrescible landfill site.

Following the construction of the Prescribed Premises, a Works Approval compliance document, addressing compliance with the Works Approval conditions, will be submitted to DEC in conjunction with an Operating Licence application. Once the Works Approval compliance document has been accepted by DEC, the Operating Licence can be issued and the Prescribed Premises can legally go into operation.



Appeals Process

Note: Appeals Convenor adjudicates all appeals and advises the Minister on appeals. Appeals determined by the Minister.
Source: EPA, 2002

enesar people and place

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PER approval process under Part IV of *Environment Protection Act 1986*

Figure No: **3.1**

3.1.2 Mining Act 1978

Under the *Mining Act 1978* (Mining Act), the proponent must submit a Mining Proposal to the Department of Industry and Resources (DoIR) prior to mining activities being undertaken on a mining tenement. A Mining Proposal is a document that provides detailed information on the identification, evaluation and management of significant environmental impacts relating to a proposed mining development and the surrounding environment. The Minerals Environment Branch of DoIR assesses the Mining Proposal and makes recommendations to the Mineral and Titles Services Division of DoIR on the environmental acceptability of the proposal.

All Mining Proposals submitted to DoIR are made publicly available via the DoIR website; however, they are not actively advertised (e.g., through the newspaper). At the time the Mining Proposal is submitted, it is expected that detailed design information on the major components of the mining operation, such as detailed pit design, waste rock dump design and tailing storage facility design, will be available. This information is used to assess the potential environmental impacts of these and other aspects of the project.

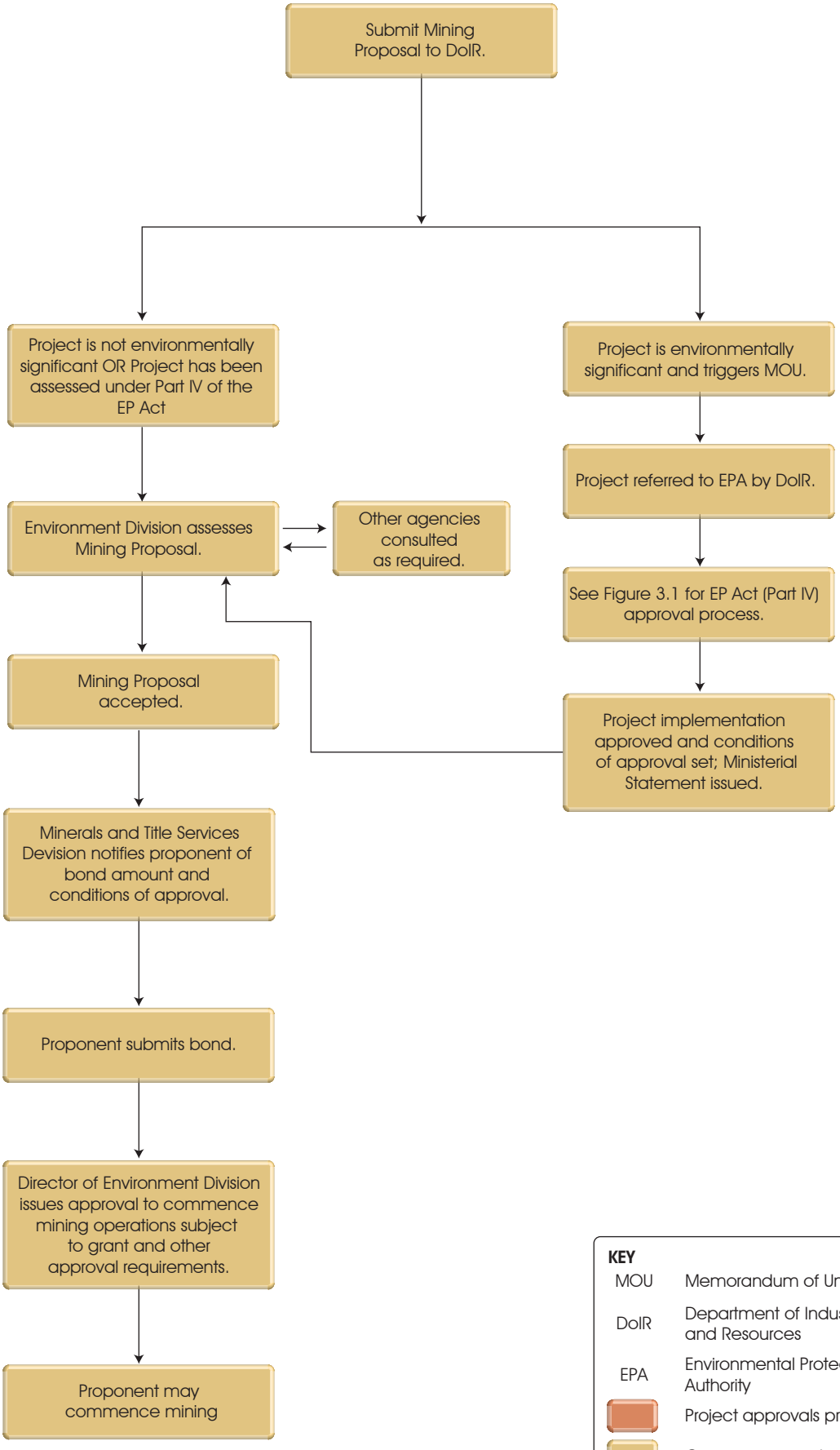
This PER document will be provided to DoIR as supporting information for the Mining Proposal application; however, the Mining Proposal will be a stand-alone document. The process for approving a Mining Proposal is provided in Figure 3.2. For projects subject to formal assessment under Part IV of the EP Act, DoIR will not approve the Mining Proposal until approval of the project under Part IV of the EP Act has been granted by the Minister for the Environment.

Environmental commitments made in the Mining Proposal become legally binding obligations once the Mining Proposal is approved.

3.1.3 Other Relevant Legislation

Other Western Australia legislation relevant to the project includes the following Acts, associated amendments and regulations:

- *Aboriginal Heritage Act 1972.*
- *Agriculture and Related Resources Protection Act 1976.*
- *Bush Fires Act 1954.*
- *Conservation and Land Management Act 1984.*
- *Contaminated Sites Act 2003.*
- *Dangerous Goods (Transport) Act 1998.*
- *Dangerous Goods Safety Act 2004.*
- *Electricity Act 1945.*
- *Electricity Industry Act 2004.*
- *Explosives and Dangerous Goods Act 1961.*
- *Health Act 1911.*
- *Heritage of Western Australia Act 1990.*
- *Land Administration Act 1997.*
- *Local Government (Miscellaneous Provisions) Act 1960.*
- *Local Government Act 1995.*
- *Main Roads Act 1930.*
- *Mines Safety and Inspection Act 1994.*
- *Occupational Safety and Health Act 1984.*
- *Planning and Development Act 2005.*
- *Poisons Act 1964.*
- *Radiation Safety Act 1975.*
- *Rail Freight System Act 2000.*
- *Rail Safety Act 1998.*
- *Rights in Water and Irrigation Act 1914.*
- *Soil and Land Conservation Act 1945.*
- *Water Services Licensing Act 1995.*
- *Water Supply Sewerage and Drainage Act 1912.*
- *Waterways Conservation Act 1976.*
- *Wildlife Conservation Act 1950.*
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004.
- Environmental Protection (Controlled Wastes) Regulations 2004
- Environmental Protection Regulations (Noise) 1997.



Note: Process depicted assumes that the proponent holds a mining lease over the land in question.

Source: DoIR, 2006a.

enesar people and place	Job No: we08009	Karara Management Services Pty Ltd	***Mining Act 1978* approvals process**	Figure No: 3.2
	File No: 8009_09_F03.02_FT	Mungada Ridge Hematite Project		

3.2 Commonwealth

3.2.1 Environment Protection and Biodiversity Conservation Act 1999

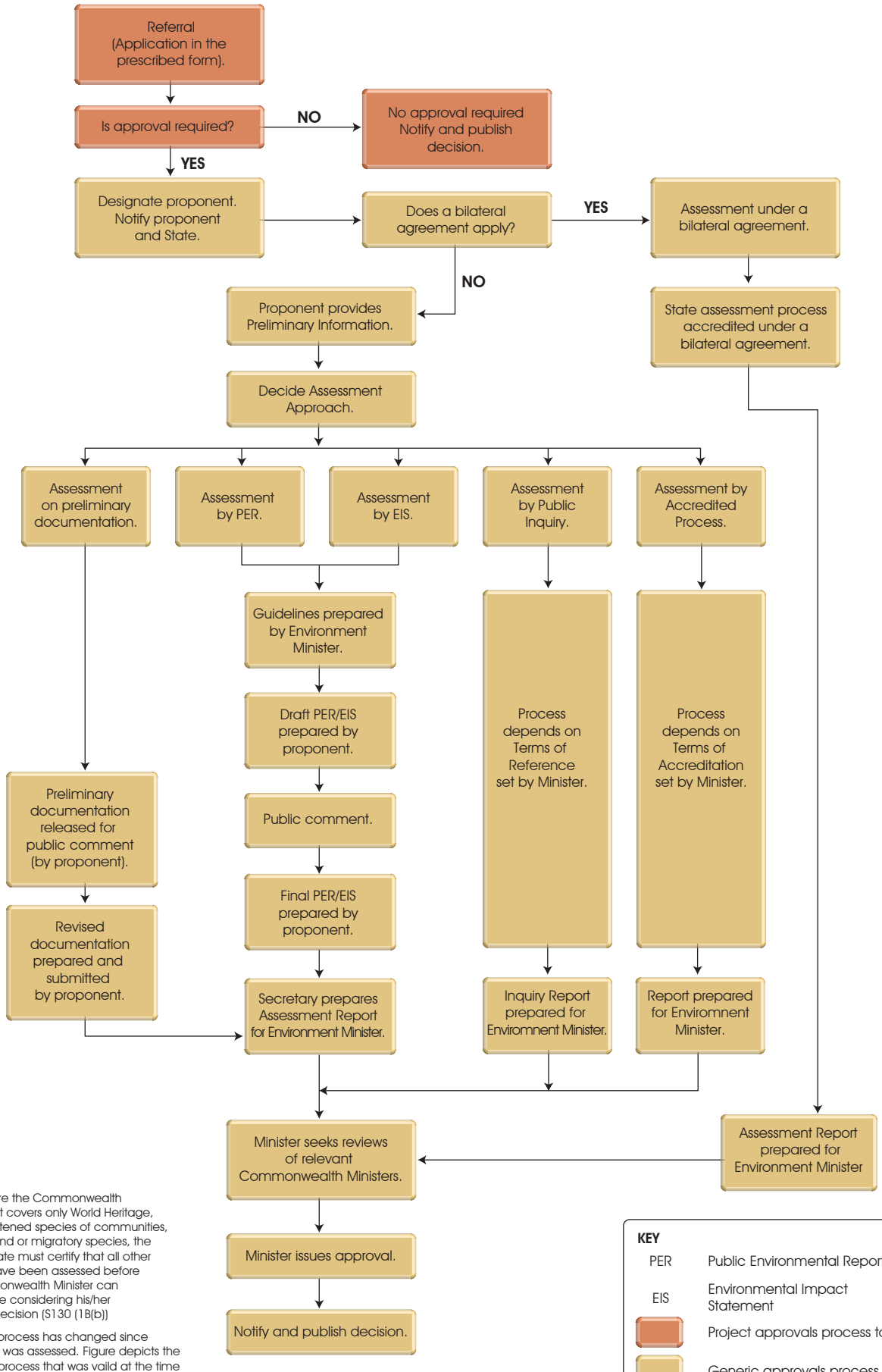
The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is a Commonwealth Act that is managed by the Department of Environment and Water Resources (formerly the Department of Environment and Heritage). The approval process under the EPBC Act is outlined in the flow chart in Figure 3.3. Projects require referral to the Department of Environment and Water Resources if there is the potential for impacts to matters of national significance. The Department of Environment and Water Resources then determines whether the project requires formal assessment and if so sets the level of assessment. If formal assessment is required then the Department of Environment and Water Resources may accredit the state approval process.

On 12 May 2006, this project was referred to the Department of Environment and Water Resources under the EPBC Act. On 13 June 2006, the Department of Environment and Water Resources provided advice that the referral had been considered and it was determined that the project is not a controlled action. Approval is therefore not required under Part 9 of the EPBC Act (see Figure 3.3). Not withstanding this assessment, the potential impacts to matters of national environmental significance as a result of the project have been assessed within this document.

3.2.2 Other Relevant Legislation

Other Commonwealth legislation relevant to the project includes the following acts and associated amendments and regulations:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984.*
- *Australian Heritage Commission Act 1975.*
- *Native Title Act 1993.*



Note: Where the Commonwealth assessment covers only World Heritage, listed threatened species of communities, wetlands and or migratory species, the relevant State must certify that all other impacts have been assessed before the Commonwealth Minister can commence considering his/her approval decision (S130 (1B(b))

Approvals process has changed since the project was assessed. Figure depicts the approvals process that was vaild at the time the project was assessed.

Source: DEH, 2005.

enesar people and place	Job No: we08009 File No: 8009_09_F03.03_FT	Karara Management Services Pty Ltd Mungada Ridge Hematite Project	***Environment Protection and Biodiversity Conservation Act 1999* approvals process**	Figure No: 3.3

3.3 Additional Approvals Required

In addition to the environmental approvals processes discussed above, a number of permits and approvals are required for varying components of the project prior to either construction or operation. Table 3.1 summarises all the approvals that KMS will require for the project.

Table 3.1 Summary of approval requirements

Legislation	Approval Required	Supporting Document(s)	Agency[1]
Project Element : Approval process required for assessing all elements of the Mungada Ridge Hematite Project			
Environmental Protection Act 1986, Part IV	State Ministerial Statement	Public Environmental Review	EPA
Environmental Protection Act 1986, Part V	Works Approval	Application for Works Approval	DEC
	Operating Licence	Application for Operating Licence	DEC
Aboriginal Heritage Act 1972	Ministerial Approval (if operations interfere with an Aboriginal site)	Section 18 Notice and Survey Report	DIA
Local Government (Miscellaneous Provisions) Act 1960	Building Licence	Application for Building Licence	SoP
Project Element : Hematite mining tenure			
Mining Act 1978	Mining Lease	Application for Mining Tenement (Mining Lease)	DoIR
	General Purpose Lease/Miscellaneous Licence	Application for Mining Tenement (General Purpose lease /Miscellaneous Licence)	DoIR
Project Element : Hematite minesite			
Mine Safety and Inspection Act 1994	Project Management Plan	Project Management Plan	DoCEP
Project Element : Explosives and dangerous goods			
Explosives and Dangerous Goods Act 1961	Magazine Licence	Application for Licence to Store Explosives	DoCEP
	Licence to Store Dangerous Goods	Application for Licence to Store Dangerous Goods	DoCEP
Dangerous Goods (Transport) Act 1998	Licence to Transport Dangerous Goods	Application for Explosives Vehicle Licence	DoCEP
Project Element : Accommodation village expansion/ construction			
Mining Act 1978	General Purpose Lease	Application for Mining Tenement (General Purpose Lease) and Mining Proposal	DoIR
Local Government Act (Miscellaneous Provisions) 1960	Building Licence	Application for Building Licence	SoP
Project Element : Mungada Road upgrade (haul road)			
Local Government Act 1995	Planning Approval	Planning Submission	SoP
	Potential Licence for borrow pits – [extractive industry local law]	Licence	SoM
Main Roads Act 1930	Main Roads Approval	Main Roads application	MR WA
Planning and Development Act 2005	Planning Approval	Planning Submission	SoP
Rights in Water and Irrigation Act 1914	Licence to Construct Wells Licence to Take Water	Application 26D Licence to Construct or Alter Wells Application 5C Licence to Take Groundwater	DoW

Table 3.1 Summary of approval requirements (cont'd)

Project Element : Rail siding			
Rail Safety Act 1998	Registration of Siding	Registration application	ORS
Mining Act 1978	Miscellaneous Licence	Application for Mining Tenement (Miscellaneous Licence)	DoIR
Rights in Water and Irrigation Act 1914	Licence to Construct Wells Licence to Take Water	Application 26D Licence to Construct or Alter Wells Application 5C Licence to Take Groundwater	DoW
Rail Freight System Act 2000	Potential consent of Public Transport Authority (PTA) to construct infrastructure on corridor land or use in a way that could materially interfere with the PTA's future use.	Application for consent	PTA
Project Element : Water supply and wastewater			
Health Act 1911	Approval to construct or install apparatus for treatment of sewage	Application for the installation of sewage treatment and disposal equipment	SoP
	Permit to Operate sewage treatment and disposal equipment	Application and inspection by Environmental Health Officer	DoH
Rights in Water and Irrigation Act 1914	Licence to Construct Wells	Application 26D Licence to Construct or Alter Wells	DoW
	Licence to Take Water	Application 5C Licence to Take Groundwater	
Project Element : Sewage facility			
Environmental Protection Act 1986	Works Approval	Application for Works Approval	DEC
	Operating Licence	Application for Operating Licence	
Health Act 1911	Approval for the installation of wastewater treatment and disposal equipment	Application for the installation of wastewater treatment and disposal equipment	SoP
	Permit to Operate wastewater treatment and disposal equipment	Application and inspection by Environmental Health Officer	DoH
Project Element : Potable water supply			
Rights in Water and Irrigation Act 1914	Licence to Construct Wells Licence to Take Water	Application 26D Licence to Construct or Alter Wells Application 5C Licence to Take Groundwater	DoW
Project Element : Other Approvals			
Wildlife Conservation Act 1950	Potential Approval to Take Declared Rare Flora	Application for Approval to Take Declared Rare Flora Rare Flora Report Form	DEC
Environment Protection and Biodiversity Conservation Act 1999	Potential Permit to Take/Injure Listed Threatened Species or Community	General Application Form for listed species or ecological communities permit	DEWR
Poisons Act 1964	Potential Permit to purchase poisons for industrial purposes	Application Form for a Permit to Purchase or Distribute Poisons	DoH
Radiation Safety Act 1975	Potential Licence to use a radioactive substance	Application for a Licence to use a Radioactive Substance	RSC

[1]DEC	Department of Environment and Conservation	EPA	Environmental Protection Authority
DEWR	Department of Environment and Water Resources	MR WA	Main Roads WA
DIA	Department of Indigenous Affairs	ORS	Office of Rail Safety
DoCEP	Department of Consumer and Employment Protection	PTA	Public Transport Authority
DoH	Department of Health	RSC	Radiation Safety Council
DoIR	Department of Industry and Resources	SoM	Shire of Morawa
DoW	Department of Water	SoP	Shire of Perenjori

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4. Stakeholder Consultation

Gindalbie believes that continuous improvement in the areas of Environment, Community and Safety is fundamental to ongoing sustainability and success. Our relationship with our employees, neighbours and the wider community is important to the long term success and sustainability of our operations.

Gindalbie - Corporate Community Commitment

4.1 Consultation Program

KMS is committed to an open, transparent environmental assessment and approval process. At each of the critical stages of the process, KMS has consulted with regulators and key stakeholders to ensure that any potential concerns are raised and addressed. The principal objectives of the stakeholder consultation program to date have been to:

- Identify interested and affected individuals and groups and understand the nature of stakeholder interests in the project.
- Provide accurate information about the project to stakeholders in a timely fashion, thereby reducing the potential for stakeholder dissatisfaction, which can result from a misunderstanding of the project and, particularly for local communities, either a real or perceived exclusion from the assessment and approval process.
- Ensure that local communities and government are properly informed about the project and that these stakeholders have adequate and timely opportunities to provide input into the assessment and approval process and express any of their relevant problems, difficulties or concerns.
- Minimise the risk of delays to the project by gaining approvals as scheduled through ensuring that issues or concerns are dealt with during the assessment and approval process rather than after submission of the required documentation.
- Ensure that the relevant regulatory requirements are being met with regard to appropriate stakeholder input to the process.
- Provide the basis for ongoing consultation through construction, operation and mine closure phases of the project.

To achieve the objectives, KMS has utilised a number of communication mechanisms to facilitate consultation. These have included:

- Project briefings: held with key stakeholders at key project milestones (e.g., environmental assessment scoping, study findings and mitigation planning).
- One-on-one technical discussions: organising and attending one-on-one meetings with stakeholders for information dissemination, obtaining stakeholder input to project planning and discussions relating to technical issues.
- Lands and easement meetings: held with landholders and land managers, native title claimants and Aboriginal communities in relation to access and compensation negotiations.
- Information releases; dissemination of information to the wider community, e.g.:
  - Media releases.
  - Public notices advising of invitation to comment on project information and permit applications.

4.2 Relevant Stakeholders

Stakeholders are individuals or parties with an interest in the project that can potentially influence or are influenced by the project. On many occasions, consultations with stakeholders have covered aspects of both the Mungada Ridge Hematite Project and the Karara Magnetite Project (both these projects comprise the

Karara Iron Ore Project); and for this reason, stakeholders in and consultation activities for both projects are presented here. A diverse range of stakeholders has been identified as having an interest in the Karara Iron Ore Project.

Table 4.1 lists the key stakeholders and groups them into broad categories reflecting their interests.

4.3 Matters Discussed and Issues Raised

Since February 2005, KMS has consulted with a range of organisations and individuals regarding the Karara Iron Ore Project. A summary of the consultation activities to date with key stakeholders, and the matters discussed, is provided in Table 4.2.

Table 4.1 Key stakeholders

Stakeholder Category	Organisation/Agency
Holders of neighbouring pastoral stations and tenements	Karara Station
	Ninghan Station
	Badja Station
	Midwest Corporation Ltd
	Comet Resources Ltd
	Monarch Gold Mining Company Ltd
	Asia Iron Ltd
	Mt Gibson Iron Ltd
	Oxiana Ltd (Golden Grove)
Freehold landholders	Numerous individual landholders
Indigenous groups	Widi Mob
	Widi Binyardi
	Yamatji Land and Sea Council (Geraldton)
Employee and industry groups	Permanent and contracted employees
	Geraldton Iron Ore Alliance
Interested groups and organisations	Conservation Council of Western Australian Inc.
	Wildflower Society of Western Australia Inc.
	Western Australian Museum
	Morawa Landcare Group Inc.
Utility and infrastructure groups	Western Power
	Economic Regulatory Authority (Rail Division)
	Geraldton Port Authority
	Main Roads Western Australia
	Landcorp
	WestNet Rail
	Water Corporation

Table 4.1 Key stakeholders (cont'd)

Stakeholder Category	Organisation/Agency
Local and regional services and businesses	Mid-West Development Commission
	State Emergency Services
	Fire and Emergency Services Authority
Local government authorities	Shire of Morawa
	Shire of Perenjori
	Shire of Mingenew
	Shire of Greenough
	Shire of Irwin
	City of Geraldton-Greenough
State government agencies	Department of Environment and Conservation
	Department of Indigenous Affairs
	Department of Industry and Resources
	Department of Planning and Infrastructure
	Department of Housing and Works
	Department of Water
	Department of Health
	Department of Consumer and Employment Protection
	Environmental Protection Authority
	Office of Development Approvals Coordination
Commonwealth government agencies	Department of the Environment and Water Resources
Political representatives	Shire Councillors
	State Members of Parliament
	Federal Members of Parliament
Wider community and general public	Community members

Table 4.2 Stakeholder consultation to date

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
Holders of neighbouring pastoral stations and tenements			
Scott Chisolm - Karara Station Lease Manager	Feb 2005	Discussed proposed exploration activity within the Karara Pastoral Station.	Not applicable
	Dec 2006	Heritage survey and site access.	Not applicable
Peter Woodhead – Karara Station Caretaker	Feb 2005	Discussed proposed exploration activity within the Karara Pastoral Station.	Not applicable
	May 2007	Timing of exploration geophysical survey.	Not applicable
Don Bell – Ninghan Station Owner	May 2007	Permission to access property for exploration geophysical survey.	Not applicable
Roger Pitman – Badja Station Owner	May 2007	Discussed KMS' plans for water exploration and possible abstraction.	Magnetite Project PER
Midwest Corporation Limited	Nov 2005	Discussion regarding the potential for an infrastructure corridor and baseline data sharing.	Magnetite Project PER
	Feb 2006	Discussion regarding the potential for an infrastructure corridor and baseline data sharing.	Magnetite Project PER

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
Holders of neighbouring pastoral stations and tenements (cont'd)			
Midwest Corporation Limited (cont'd)	Jan 2007	Discussion and agreement regarding the sharing of baseline data.	Cumulative Impact Assessment addendum document[1]
	Jun 2007	Discussion regarding cumulative impact assessment.	Cumulative Impact Assessment addendum document
Asia Iron Ltd	May 2007	Discussion regarding potential joint access for linear infrastructure within Geraldton Southern Transport Corridor (GSTC)	Magnetite Project PER
Freehold landholders			
Colin and Carol Malcolm	Apr 2006	Discussion regarding the timing of KMS' and Midwest Corporation Ltd's land requirements at the rail siding to determine whether a crop could be planted.	Not applicable
	Nov 2006	Discussion on proposed rail siding design and development schedule.	Sections 6.1.3, 6.3, & 6.11
	May 2007	Survey access for additional studies of Tilley East Siding.	Not applicable
David Baxter	May 2007	Survey access for additional studies of Tilley East Siding.	Not applicable
Andrew Moore	Mar 2006	Discussed water and gravel availability near property.	Not applicable
Kev and Val Coughlan, and James family	Feb 2007	Discussions regarding potential noise, visual amenity and dust issues at Tilley Siding.	Sections 6.1.3, 6.11, 7.6, 7.8 & 7.9
	Mar 2007	Discussed noise issues relating to Tilley Siding.	Section 7.9
Landholders along proposed linear infrastructure corridor and borefield area (approx. 80)	Sep 2006	Pipeline issues and access. Water supplies in the Mingenew area.	Magnetite Project PER
Landholders along proposed linear infrastructure corridor and borefield area (approx. 80) (cont'd)	Jan 2007	Water allocations and search areas. Survey access.	Magnetite Project PER
	Feb 2007	Survey access, water access, and pump station placement.	Magnetite Project PER
	Mar 2007	Survey access, water access, and pump station placement.	Magnetite Project PER
	Apr 2007	Test bore pumping and bore monitoring in the Mingenew area.	Magnetite Project PER
Gary Cosgrove	Oct 2006	Site location of test bore, permission to access property.	Magnetite Project PER

[1] An assessment of the cumulative impacts on flora and fauna from the Mungada Ridge Hematite Project, the Karara Magnetite Project and Mid West Corporation's Blue Hills Project is currently being prepared and will be available for pubic comment as an addendum to the Karara Magnetite Project PER.

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
Indigenous groups			
Widi Mob	Feb 2005	Discussion of the southwest tip of Mt Karara.	Magnetite Project PER
	Apr 2005	Introduction to the project.	Not applicable
	Aug 2005	Project update.	Not applicable
	Jan 2006	Project update.	Not applicable
	Jan 2006	Receipt of letter confirming that the Widi Mob had no further cultural knowledge of the area to supply to the Department of Indigenous Affairs.	Not applicable
	Jun 2006	Site visit to Karara. Archaeological and ethnographic surveys in relation to proposed exploration drilling programs.	Section 7.12
Widi Binyardi	Feb 2005	Discussion of the southwest tip of Mt Karara.	Magnetite Project PER
Yamatji Land and Sea Council (Geraldton)	Mar 2006	Provision of any other associated Aboriginal groups that may have connections to the Blue Hills area.	Not applicable
Employee and industry groups			
Permanent and contracted employees	Ongoing	Monthly newsletter (Iron Clad) with project and company information.	Not applicable
Geraldton Iron Ore Alliance	Ongoing	Gindalbie has been an active member since inception and attends regular (monthly) meetings to discuss various issues and synergies between alliance members.	Not applicable
Interested groups and organisations			
Conservation Council of Western Australia	Oct 2005	Attempted to contact to discuss the project.	Not applicable
	Nov 2005	Attempted to contact on four occasions to discuss the project.	Not applicable
	May 2006	Joint meeting with the Wildflower Society of WA. Introduction to the project and discussion of key concerns. These were: • Site visit request for personnel. • Dust impacts and management. • Surface water and drainage management. • Landform characterisation. • Fauna response plan, if appropriate.	 Not applicable Section 7.8 Section 7.2 Section 7.1 Section 7.5
	May 2007	Representatives of KMS attended the Banded Ironstone Formation (BIF) Forum	Not applicable
Wildflower Society of Western Australia	Oct 2005	Introduction to the project and identification of key concerns. These were: • Presence of significant flora. • Impacts to visual amenity of landforms.	 Section 7.4 Section 7.6
	May 2006	Joint meeting with Conservation Council of Western Australia. See issues raised above.	Sections 7.1, 7.2, 7.5 & 7.8
Western Australian Museum	Jun 2006	Discussion and recommendations regarding survey methodology for short-range endemics and stygofauna.	Section 7.5
Landcare - Morawa	Jun 2007	Potential establishment of a nursery, as a new business, in the shire to assist KMS with rehabilitation requirements.	Section 6.17

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
Utility and infrastructure groups			
Geraldton Port Authority	Jul 2006	Introduction to the project and discussion of the options for shipping facilities at the Port of Geraldton and the requirements of Geraldton Port Authority.	Section 6.12
Public Transport Authority	Mar 2006	Details of Public Transport Authority's requirements at the rail siding over spur ground.	Not applicable
	Nov 2006	Discussion of the proposed rail siding developments for KMS and Midwest Corporation Ltd.	Sections 6.1.3 & 6.11
Landcorp	Sep 2005	Proposals for land request at Narngulu.	Magnetite Project PER
	Mar 2006	Proposals for Oakajee Port.	Magnetite Project PER
WestNet Rail	Nov 2006	Discussion of the proposed Tilley rail siding development.	Sections 6.1.3 & 6.11
	May 2007	Discussion of rail infrastructure capabilities.	Sections 6.1.3 & 6.11
Western Power	Nov 2006 – ongoing	Connection to existing South West Interconnected System (SWIS) corridor alignment.	Magnetite Project PER
Water Corporation	Jun 2007	Potential receiver for return water reuse.	Magnetite Project PER
Local and regional services and businesses			
Mid-West Development Commission	Nov 2005	Introduction to the project.	Not applicable
Local government authorities			
Shire of Morawa	Oct 2005	Introduction to the project.	Not applicable
	Feb 2006	Project update and enquiry about road and land availability.	Not applicable
	Apr 2006	Requested information on the shire requirements for road train permits.	Not applicable
	Oct 2006	Briefing on proposed shire agreements.	Not applicable
	Nov 2006	Project briefing and discussion regarding the proposed timelines.	Not applicable
	Jun 2007	Presentation and discussion regarding potential employment opportunities created by the project.	Not applicable
	Jun 2007	Discussion regarding potential powerline easement.	Magnetite project PER
Shire of Perenjori	Oct 2005	Introduction to the project.	Not applicable
	Feb 2006	Project update and enquiry about road and land availability.	Not applicable
	Apr 2006	Requested information on the shire requirements for road train permits.	Not applicable
	Nov 2006	Project briefing and discussion regarding the proposed timelines.	Not applicable
	Jun 2007	Presentation and discussion regarding potential employment opportunities created by the project.	Not applicable
	Jun 2007	Discussion regarding potential powerline easement.	Magnetite project PER

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
Local government authorities (cont'd)			
Shire of Mingenew	Nov 2006	Project briefing and discussion regarding the proposed timelines.	Not applicable
	Apr 2007	Test bore pumping information.	Magnetite PER
	Jun 2007	Discussion regarding potential powerline easement.	Magnetite project PER
Shire of Greenough	Nov 2006	Project briefing and discussion regarding the proposed timelines.	Not applicable
	Jun 2007	Discussion regarding potential powerline easement.	Magnetite project PER
Shire of Irwin	Nov 2006	Project briefing and discussion regarding the proposed timelines.	Not applicable
	Jun 2007	Discussion regarding potential powerline easement.	Magnetite project PER
State government agencies			
Department of Environment and Conservation – Perth (includes consultation with the former Department of Environment and Department of Conservation and Land Management)	Feb 2005	Introduction to the project and discussion of potential impacts as a result of the project. The main issues raised were:	
		• Flora issues related to the development within the minesite area.	Section 7.4
		• Regional implications.	Section 7.4
	May 2006	DoIR representative in attendance. Project update and discussion of potential impacts as a result of the project. The main issues:	
		• Road safety.	Sections 6.10 & 7.10
		• Rare and protected flora at the minesite.	Section 7.4
		• The need for flora surveys to follow the methods of Neil Gibson's work.	Section 7.4
		• The requirement for spring flora surveys.	Section 7.4
		• The importance of species definitions (PER).	Section 7.4
	Jun 2006	Discussion regarding the continuation of exploration for hematite and magnetite deposits during the assessment of PERs.	Not applicable
	Sep 2006	EPA, DoIR and WA Museum representatives in attendance. Discussion of fauna survey methods and findings to date, particularly in regard to malleefowl, skinks, short-range endemics, and subterranean fauna. Discussed potential requirements for additional fauna surveys, recommended in the draft fauna report. DEC and WA Museum felt that additional surveys were only required for shield-backed trapdoor spider and Woolley's pseudantechinus[1].	Section 7.5

[1]The draft fauna report recommended seven fauna species for further field work. After discussion with the DEC and the WA Museum, two species (shield-backed trapdoor spider and Woolley's pseudantechinus) were targeted for further survey. The other five species did not require further field work for the following reasons: The scorpion (*Urodacus* sp. nov (Mt Gairdner)) is likely to be found in isolated habitats throughout the northern wheatbelt and is unlikely to be at risk from this project. The millipede (*Antichiropus* sp. nov PM1) belongs to an abundant and diverse genus, has been previously recorded by the WA Museum and is likely to be relatively wide spread. The presence of the frog, *Neobatrachus centralis*, has not been confirmed on site. As there are few wetland communities, and these are unlikely to be impacted by the project, no further survey was required. The preferred habitat of the skink, *Egernia stokesii badia*, and the cockatoo, *Cacatua leadbeateri*, is common in the area and the project is unlikely to pose a significant risk to these species.

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
State government agencies (cont'd)			
Department of Environment and Conservation – Perth (cont'd)	Jan 2007	Follow up on Water Extraction Licence application and clarifications on the Karara Iron Ore Project's total water requirements and operational philosophy.	Magnetite Project PER
	Jan 2007	Meeting to discuss environmental offsets.	Section 8.3
	Jan 2007	Project update discussion of flora surveys and plant species of interest.	Section 7.4
	Feb 2007	Meeting to discuss details of the flora baseline and impact assessment reports for the Hematite Project minesite. Discussion of cumulative impact assessment.	Section 7.4 & Cumulative Impact Assessment addendum document
Department of Environment and Conservation – Geraldton (includes consultation with the former DoE and CALM)	Apr 2005	Project introduction. Discussion of the proposed exploration program and request for consent.	Not applicable
	Aug 2005	Overview of exploration activities to date and proposed future exploration.	Not applicable
	Aug 2005	Discussion of the proposed exploration program and request for consent.	Not applicable
	Feb 2006	Discussion of the proposed exploration program and request for consent.	Not applicable
	May 2006	Project update. Concern was expressed in regard to Part V licensing (i.e., water sources and wastewater issues, discharge, etc.).	Section 3.3
	Jul 2006	Discussed the proposed exploration program and requested consent.	Not applicable
	Jan 2007	Project update and discussion of flora surveys and plant species of interest.	Not applicable
	Feb 2007	Discussed the proposed exploration program and requested consent.	Not applicable
	Mar 2007	Access for survey to the reserve at Weelamby.	Not applicable
	May 2007	Project update and requested permission for access to survey borrow pit areas and road and rail corridors on DEC-managed lands.	Not applicable
Department of Indigenous Affairs – Perth	Jun 2005	KMS was advised that there was insufficient cultural knowledge for the Aboriginal Cultural Materials Committee to assess impacts.	Not applicable
	Sep 2005	KMS was advised that there was insufficient cultural knowledge of Blue Hills and the Aboriginal Cultural Materials Committee was unable to assess a Section 18 application. Other Section 18 applications have been approved for mining within same registered site (Midwest Corporation Ltd).	Not applicable
	Dec 2005	KMS was advised that there was insufficient cultural knowledge of Blue Hills and the Aboriginal Cultural Materials Committee was unable to assess a Section 18 application.	Not applicable
	Mar 2006	Advice received from the Widi Mob that a site that had been recorded over the Mungada Ridge area was no longer to be classified a site, as there was insufficient information available from the indigenous groups to constitute registration.	Not applicable

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
State government agencies (cont'd)			
Department of Indigenous Affairs – Perth (cont'd)	Jan 2006	Receipt of letter confirming that the Widi Mob had no further cultural knowledge of the area to supply to the Department of Indigenous Affairs. Letter lodged with the Department of Indigenous Affairs.	Not applicable
Department of Indigenous Affairs – Geraldton	Mar 2006	Provision of any other associated Aboriginal groups that may have connection to Blue Hills area.	Not applicable
	May 2006	Consultation with wider community of people for interest within the project area.	Not applicable
Department of Industry and Resources – Perth	Mar 2006	Project introduction.	Not applicable
	Jun 2006	Discussion regarding the continuation of exploration for hematite and magnetite deposits during the assessment of PERs.	Not applicable
	Nov 2006	Discussion of the proposed Midwest Corporation Ltd and KMS rail siding developments.	Sections 6.1.3 and 6.11
	Apr 2007	Discussion of DoIR's feedback on Draft Hematite Project PER. Issues raised: • Waste rock dump design and resistance to erosion. • Acid mine drainage potential of waste rock.	 Section 6.7 Sections 6.5 and 6.7
Department of Industry and Resources – Perth (Native Vegetation Assessment Branch)	Jan 2006	Project introduction. Determination of need for Native Vegetation Clearing Permit for project.	Not applicable. A separate Native Vegetation Clearing Permit will not be required.
Department of Planning and Infrastructure – Perth	Mar 2006	Project update.	Not applicable
	Nov 2006	Discussion of the proposed KMS and Midwest Corporation rail siding developments.	Sections 6.1.3 and 6.11
Department of Housing and Works	Mar 2007	Discussions regarding access above the Geraldton Southern Transport Corridor.	Magnetite Project PER
Department of Water – Perth	Jan 2007	Follow up on Water Extraction Licence application and clarification on the Karara Iron Ore Project's total water requirements and operational philosophy.	Magnetite Project PER
Department of Water – Geraldton	Oct 2006	KMS briefed the Department of Water regarding their intention to lodge a Water Extraction Licence application to extract water from the Dandaregan Sub Area Yarragadee Aquifer. Department of Water suggested that KMS would be more successful with applications made for water extractions from the Mingenew and Twin Hills aquifer.	Magnetite Project PER
Department of Health	Nov 2006	Introduction to the project and identification of Department of Health approvals requirements.	Section 3.3
Environmental Protection Authority	Sep 2005	Project update. Discussed the potential flora issues.	Not applicable
	Feb 2006	Project update.	Not applicable

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
State government agencies (cont'd)			
Environmental Protection Authority (cont'd)	May 2006	Project update. The main issues raised were:	
		• Vegetation and flora impacts.	Section 7.4
		• Seasonal timing of vegetation and flora surveys.	Section 7.4
		• Fauna impacts.	Section 7.5
		• Weed quarantine.	Section 7.4
		• Rehabilitation.	Sections 6.17 and 7.4
		• Possibility of excising the road and rail spur from the Hematite Project PER.	Not applicable
	Sep 2006	Project update.	Not applicable
	Dec 2006	Discussion of PER approval process and timelines.	Section 3.1.1
	Apr 2007	DEC also present. Discussion of fauna survey methods and report for minesite. Discussion of fauna species of interest and whether additional surveying would be required. Agreed that additional surveying for Wooley's pseudantechinus and the shield-backed trapdoor spider is warranted.	Section 7.5
	May 2007	EPA Board meeting on Magnetite Environmental Scoping Document. Document was approved subject to minor revisions, including need for spring surveys and cumulative impact assessment.	Section 7.4 and Cumulative Impact Assessment addendum document
Office of Development Approvals Coordination	Dec 2005	Introduction to the project. Discussed the Office of Development Approvals Coordination's role and procedures.	Not applicable
	Mar 2006	Project update.	Not applicable
	May 2006	Project update.	Not applicable
	Aug 2006	CALM and DoIR representatives in attendance. Update on project. Discussion of magnetite processing technology and information to include in the Project Description Document. Issues raised:	
		• Current uncertainty over power supply source requires clarification within the Environmental Scoping Document and PER.	Magnetite Project PER
		• Concern over possible impacts to remnant vegetation caused by slurry pipeline construction.	Magnetite Project PER
		• Request to avoid most sensitive areas of BIF ridges.	Sections 7.4 and 7.5
		• Request to discuss resource locations and prospectivity of leases in the PER.	Section 6.2.1 and 6.4.4
		• Need for surveying of short-range endemics.	Section 7.5
		• Need to include N. Gibson's regional BIF flora survey data.	Section 7.4

Table 4.2 Stakeholder consultation to date (cont'd)

Stakeholder	Date	Matters Discussed and/or Issues Raised	Relevant Sections in Hematite PER
State government agencies (cont'd)			
Office of Development Approvals Coordination (cont'd)	Aug 2006	Project Screening Meeting for Magnetite Project; attended by representatives from DEC, EPA, DoIR, DIA, DPI, DoH, and DoW, Introduction to project and discussion of Project Definition Document. Discussion of water supply source, allocation, return water quality and possibility of reuse by others.	Magnetite Project PER
	Dec 2006	Meeting to discuss Works Approvals required for the Magnetite Project. DoIR and DEC regional representatives present.	Magnetite Project PER
	May 2007	General discussion of ODAC's role. Update on project and PER submission dates. Discussion of EPA suggestion to include key EMPs in Hematite Project PER. Discussion of EPA's request for KMS to undertake a cumulative impact assessment.	Magnetite Project PER
	May 2007	Magnetite Project update. Discussion of slurry pipeline easement crossing numerous road reserves and other areas of Crown land; ODAC to assist with these approvals. Discussed water supply allocations.	Magnetite Project PER
Commonwealth government agencies			
Department of the Environment and Water Resources	May 2006	Discussion regarding the proposal's potential to trigger any aspect of the *Environment Protection and Biodiversity Conservation Act 1999*.	Section 3.2.1
Department of Industry Tourism and Resources	Jun 2007	Workshop with other Mid West iron ore proponents to discuss working in partnership with mining and indigenous communities.	Section 7.11
Political representatives			
Minister for Environment, Racing and Gaming	Aug 2006	Introduction to the project and discussion of proposed timelines.	Not applicable
Minister for Resource Development	Aug 2006	Introduction to the project and discussion of proposed timelines.	Not applicable
Secretary for the Minister of Indigenous Affairs	Sep 2005	KMS was advised that there was insufficient cultural knowledge of Blue Hills and the Aboriginal Cultural Materials Committee was unable to assess a Section 18 application. Other Section 18 applications were approved for mining within same registered site (Midwest Corporation Ltd).	Not applicable
City Commissioners – City of Geraldton-Greenough	Jun 2007	Introduction to the project and discussion of proposed infrastructure.	Not applicable.

4.4 Ongoing Consultation and Records

Consultation with key stakeholders will continue to be undertaken for the life of the project to ensure there is due consideration of all project-related opportunities and concerns. The mechanisms used to facilitate consultation discussed in Section 4.1 will continue to be utilised for future consultation.

During the approval consultation process, a stakeholder consultation register was developed. This register will be maintained during both the construction and operations phases of the project. It will document the detail of stakeholder consultation undertaken and relevant outcomes, such as commitments.

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5. Environmental and Social Context

KMS sees it as being in its own commercial interest and responsibility to assess and manage risks to its business and to respond to the impact of its activities on the environmental and social context in which it operates.

The purpose of this section is to provide an understanding of the regional context of the project with respect to environmental and social factors. Further details on the existing environmental and social factors are provided in Chapter 7.

5.1 Minesite

5.1.1 Climate

The climate at the minesite is described as being extra dry Mediterranean, characterised by seven to eight months of dry weather with cold, wet winters and hot, dry summers (Payne et al., 1998). The closest Bureau of Meteorology automatic weather station (AWS) to the minesite is the Morawa AWS, located approximately 85 km to the west of the minesite. On average, in the warmer months (November to April) temperatures at Morawa range from a daily minimum of 13°C to a daily maximum of 38°C, while in the cooler months (May to October), average temperatures range from a daily minimum of 5°C to a maximum of 29°C (Figure 5.1).

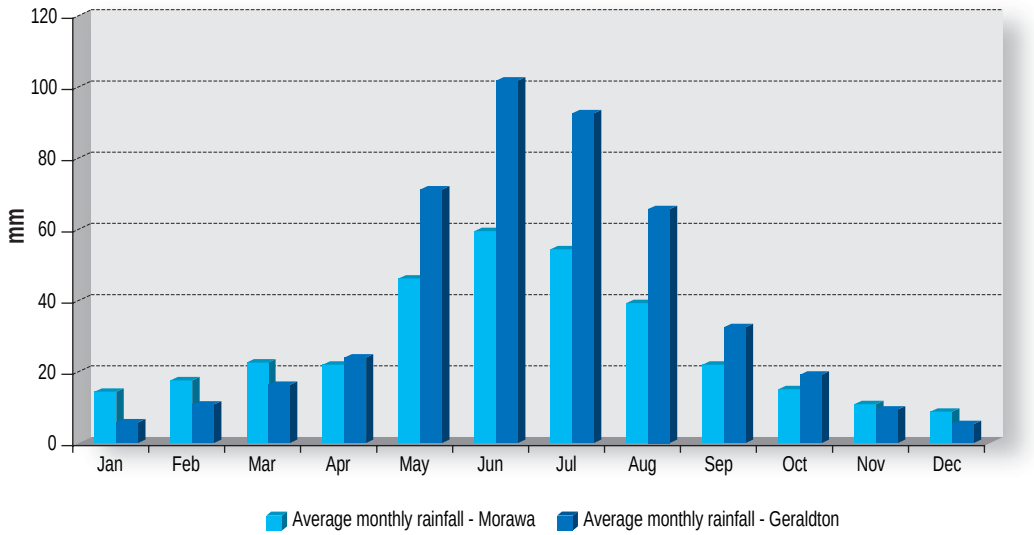
Average annual rainfall at Morawa is 333 mm, ranging from an average monthly rainfall during December of 8 mm to an average monthly rainfall during June of 60 mm (see Figure 5.1). Extreme rainfall events (i.e., a 1-in-100-year, 72-hour rainfall event) can be expected to generate 160 mm of rain.

As the Morawa AWS is not close enough to the minesite to give accurate wind information, Heggies Australia Pty Ltd used The Air Pollution Model (TAPM)[1] and compared it with meteorological data to produce site-specific wind roses. The prevailing winds at the minesite, as determined by TAPM, are shown in Figure 5.2 and are summarised below:

- In summer, the dominant wind direction is from the south-southeast through to the south-southwest.
- In autumn, the dominant wind direction is from the east.
- In winter, the dominant wind direction is from the southeast and east-southeast.
- In spring, the dominant wind direction is from the south.

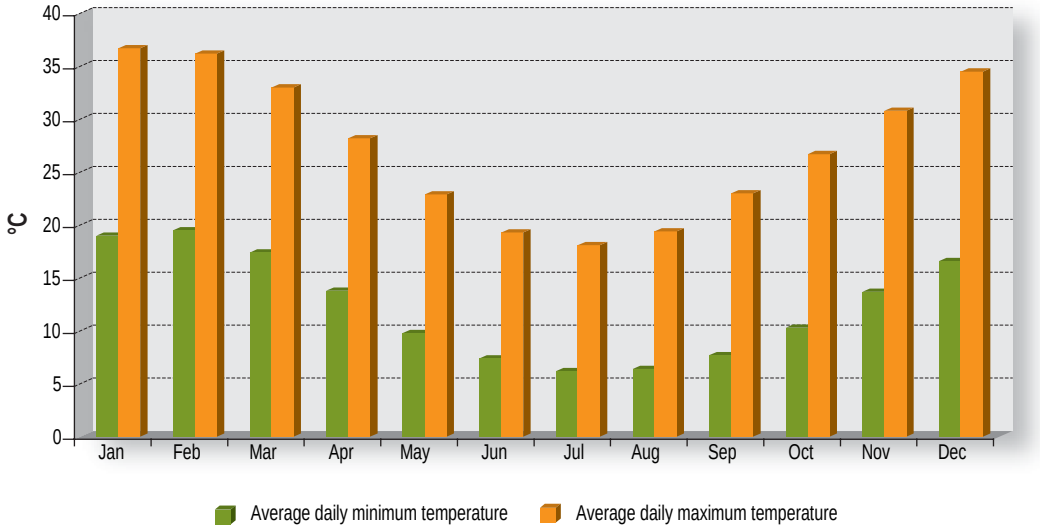
[1] TAPM was developed by the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and is a prognostic model that may be used to predict three-dimensional meteorological data. Information justifying the use of TAPM and validating the model is provided in Appendix 15.

Average monthly rainfall at Morawa and Geraldton



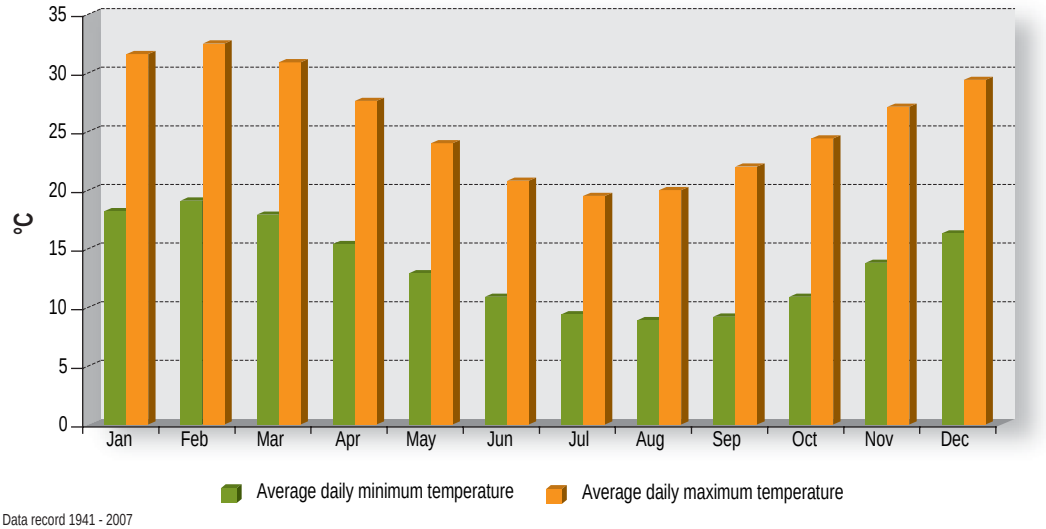
Source: BOM, 2007a. Data record 1911 - 2005. BOM 2007b. Data record 1941 - 2007

Average daily maximum and minimum temperature at Morawa



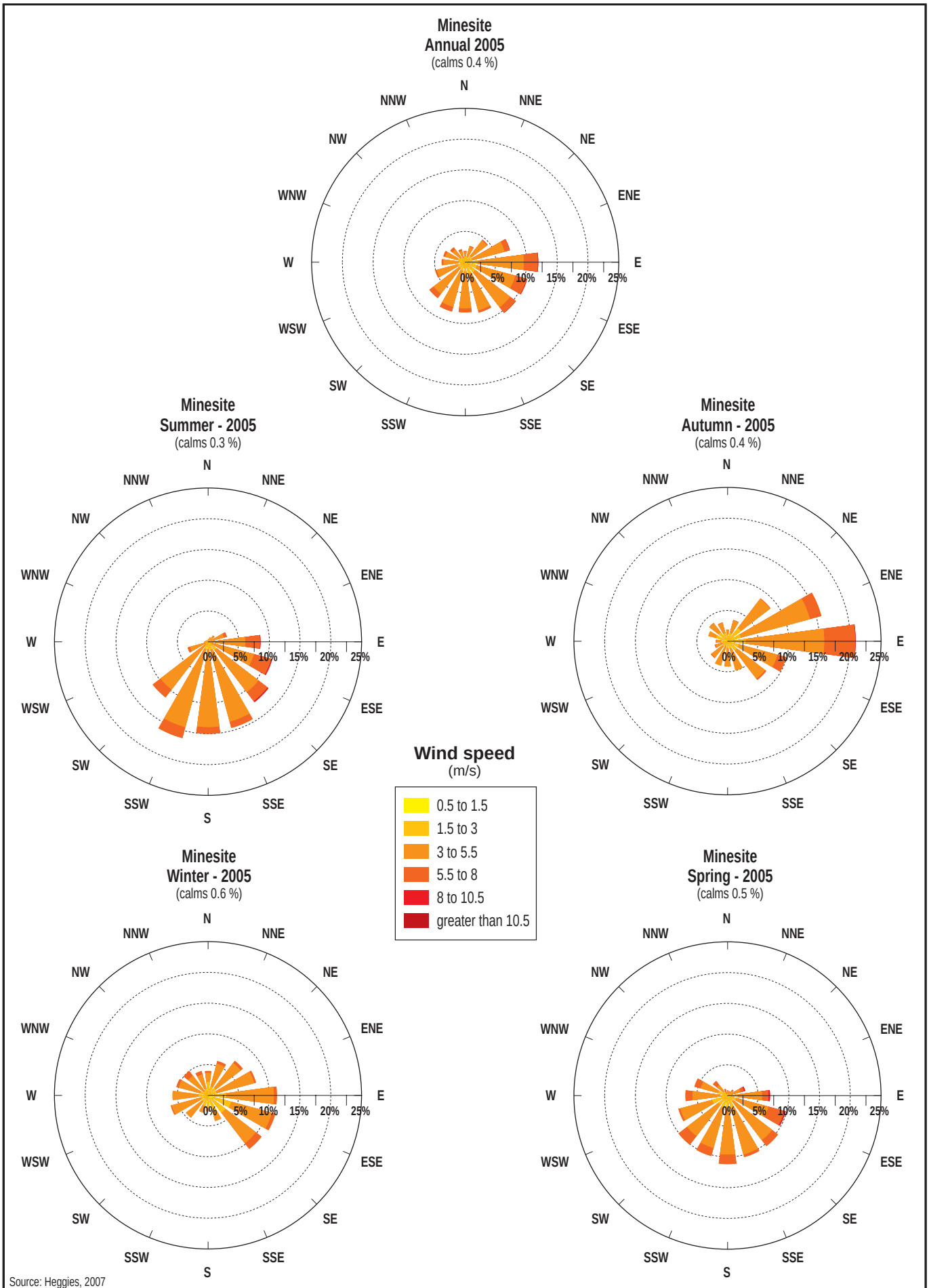
Source: BOM, 2007a. Data record 1925 - 2005

Average daily maximum and minimum temperature at Geraldton



Source: BOM, 2007b. Data record 1941 - 2007

enesar peopleandplace	Job No: we08009	Karara Management Services Pty Ltd	**Average rainfall and temperature at Morawa and Geraldton**	Figure No: 5.1
	File No: 8009_09_F05.01_FT	Mungada Ridge Hematite Project		



Source: Heggies, 2007
Note: Wind speed and direction predicted by TAPM

enesar	Job No: we08009	Karara Management Services Pty Ltd	**Minesite wind roses**	Figure No: **5.2**
	File No: 8009_09_F05.02_HB	Mungada Ridge Hematite Project		

5.1.2 Landform, Soils and Geology

The minesite is located in the Blue Hills Range, which falls within the Yalgoo-Singleton Archaean greenstone belt, in the Mid-West Region of Western Australia. The topographic relief of the area is closely related to the underlying bedrock lithology, with the banded iron formations (BIFs) forming a series of isolated peaks, hills and strike ridges in an otherwise topographically subdued regional landscape.

The soils on the upper slopes are hardsetting, shallow soils dominated by coarse fragments or rock outcrops. These soils increase in thickness down slope, still with a high proportion of coarse fragments. The plains have variable soil types ranging from flat claypan playas to broad, gently undulating plains with deep, red soils.

The occurrence of iron at the proposed minesite is related to the Windanning Formation of the Luke Creek Group and described as (Watkins & Hickman, 1990):

> a succession of abundant jaspilitic[2] BIF and grey-white chert units interlayered with felsic volcanic, volcanoclasitc, and volcanogenic rocks, and minor amounts of basalt, overlying the Gabanintha Formation.

The BIF of the Windanning Formation ranges in thickness from a few metres to 150 m. The dominant mineral in the BIF is chert (including jasper), which may be recrystallised to quartz. The area is complexly folded and faulted, especially in the vicinity of Windanning Hill (Bleakley, 2006).

[2] With red jasper bands interlayered with grey to black hematite and/or magnetic-rich bands with white chert bands a few millimetres to a few centimetres thick.

5.1.3 Flora and Fauna

The proposed project area falls within the Yalgoo bioregion of the Interim Biogeographic Regionalism for Australia (IBRA) classification system[3]. This bioregion is described as an interzone between the South-Western and Murchison bioregions, characterised by low woodlands to open woodlands of Eucalyptus, Acacia and Callitris on red sandy plains of the western Yilgarn Craton and southern Carnarvon Basin (CALM, 2003).

The IBRA system is also closely related to the classification developed by Beard (Beard, 1990). Beard's system describes the project area as being in the Yalgoo subregion of the Austin botanical district, within the Murchison botanical region. The Murchison botanical region is situated within the Eremaean province. The Austin botanical district is characterised by a predominately Mulga (*Acacia aneura*) low woodland on plains, reduced to scrub on hills, with a tree steppe of *Eucalyptus* spp. on sandplains. The Yalgoo subregion is distinctive as it is a transitional area between the Mulga areas and the southwest region and is dominated by a variety of *Acacia* species.

The BIF ridges are a feature of this bioregion, and the distinctive habitats associated with them are well represented throughout the Yalgoo bioregion. Four habitat types have been identified. The rocky crests of the BIF ridges provide a refuge and resource for fauna from surrounding habitats, as well as habitat for a number of flora and fauna species (e.g., gilled slender blue tongue and Woolley's pseudantechinus) restricted to these landforms. The mid to lower slopes of the BIF ridges are characterised by thickets and dense shrublands. These are often areas of high biodiversity and

[3] IBRA is a national classification system that divides the Australian continent into 85 bioregions and 404 subregions. Bioregions are determined by considering a number of attributes of the landscape, including climate, lithology/geology, landform, vegetation, flora and fauna, and land use. The IBRA classification system is used to enable countrywide assessment of landscape health and biodiversity.

habitat and resources for many fauna species. Temporary pools of fresh water in low-lying areas support frog and invertebrate species reliant on this type of habitat. Well developed eucalypt woodlands provides significant habitat for several species of cockatoo and skink.

The vegetation of the minesite is in good condition, although past grazing by animals has caused some damage in several relatively large, discrete areas, which have been grazed and have not yet started to regenerate.

There are no World Heritage properties, wetlands, or ecosystems within the minesite disturbance area that are listed as threatened ecological communities under the Commonwealth EPBC Act.

5.1.4 Cultural Heritage and Socio-economic Environment

The proposed minesite is within the Shire of Perenjori and is located approximately 65 km northeast of the Perenjori townsite (see Figure 1.1). Settlement of the Perenjori Shire by Europeans first took place in the 1870s after gold and copper were discovered; however, major in-migration did not occur until the 1900s when agriculture became a major industry in the area. Perenjori was gazetted as a townsite in 1916 (Shire of Perenjori, 2006).

Mineral exploration in the shire was undertaken by WMC between 1962 and 1973. At that time, WMC began mining of two open pits, known as Mungada and Mungada West, at the site of the Mungada Ridge Hematite Project. Ore from these pits complemented mining at WMC's Koolanooka operation, which had already been established in the Shire of Morawa (see Section 5.2.4).

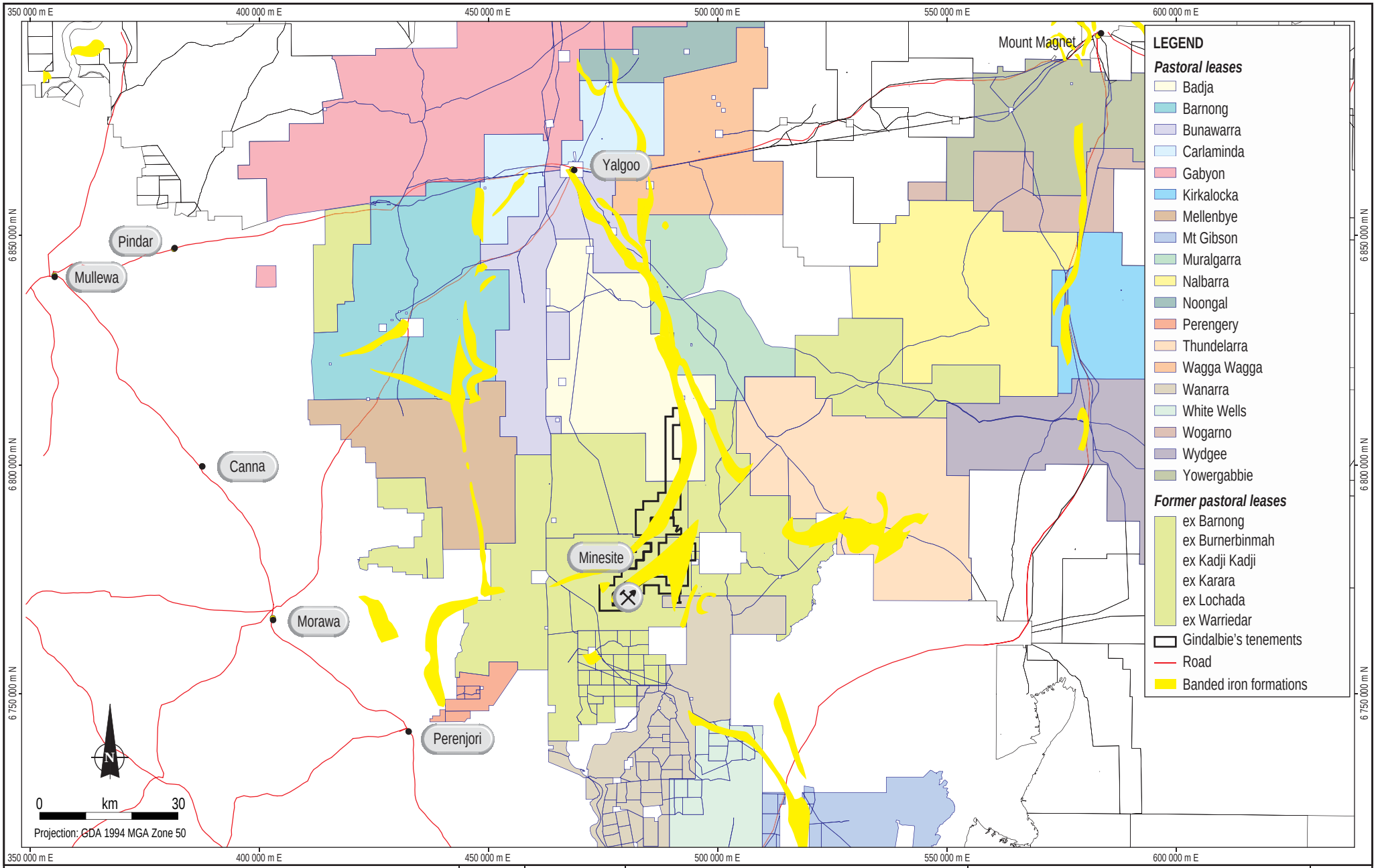
The population of the Shire of Perenjori has been declining since 1999 due to a weakening agricultural sector and greater job opportunities in growing regional centres, such as Dongara and Geraldton. Perenjori is the major town in the shire and has a population of approximately 300 people. Wheat and wool growing are the main industries in the area at the current time. Perenjori currently has five cooperative bulk holding receiving points in the shire; and farmers grow a wide range of cereals, including wheat, malting barley, lupines, canola, field peas and chick peas (Shire of Perenjori, 2006).

5.1.5 Land Use, Tenure and Conservation Significance

Current land use in the Shire of Perenjori is predominately agricultural with some land used for mineral exploration and timber reserves. The proposed minesite lies within the former Karara Pastoral Lease. This pastoral lease was purchased by the Department of Conservation and Land Management (CALM) in 2002 and is currently managed by DEC for conservation purposes under Section 33(2) of the Conservation and Land Management Act. DEC's management plan for this land does not exclude mining from this area and the minesite is within Mining Leases M59/649, M59/650 (granted leases) and M59/721 (approval of the latter is pending).

There are no registered native title claims over the minesite area. Two claimant groups, the Widi Mob and the Widi Binyardi, hold unregistered native title claims over the minesite area.

DEC is planning to establish a conservation park in the Mid-West Region that will include portions of a number of former pastoral leases, including Lochada, Kadji Kadji, Burnabinmah, Warridar and Karara (CALM, 2003). This conservation park will incorporate areas of BIF ridges that are not within proposed resource development areas (Figure 5.3), ensuring that these landforms are represented in the conservation estate.



Source: Topography - DLI
Pastoral leases - DLI
BIF Ridges - DoIR
Drawn: CAD Resources

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File No: 8009_09_F05.03_FT

Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Current and former pastoral leases in the minesite region

Figure No: **5.3**

5.2 Rail Siding and Haul Road

5.2.1 Climate

The temperature and rainfall at the rail siding (located 3 km north north-east of Morawa) is similar to that of the minesite (see Figure 5.1).

Prevailing winds at the rail siding, shown in Figure 5.4, are slightly different from the minesite and are summarised below:

- In summer, the dominant wind direction is from the south.
- In autumn, the dominant wind direction is from the east through to the south.
- In winter, the dominant wind direction is from the west.
- In spring, the dominant wind direction is from the south through to the west.

Wind speeds in Morawa peak during summer, with average monthly wind speeds varying from 10.6 km/hour in August to 16.9 km/hour in December and January (DoAF, 2006).

5.2.2 Landform, Soils and Geology

Landform and soil morphology of the rail siding is depicted on the 1:250,000-scale Soil: Landscape Mapping in South Western Australia prepared by the Western Australia Department of Agriculture (Schokneckt et al., 2004). The rail siding is located in the Morawa land system and is also overlain by the Noolagabbi land system to the north and south.

The Morawa land system comprises gently undulating low rises and ridges. Slopes are typically covered by loose rock debris (colluvium) over granite or gneissic bedrock. Soils are red and yellow loamy earths and red shallow sands.

The Noolagabbi land system consists of extensive flats and gently inclined slopes in broad valleys with soils that are red-brown hardpan shallow loams and red loamy earths. It is also associated with drainage networks, which are often saline.

The haul road crosses gently undulating plains broken by occasional hills and ridge lines. These land systems are typical of the region. The soils and landforms along the haul road are described in detail in Section 7.1.1.

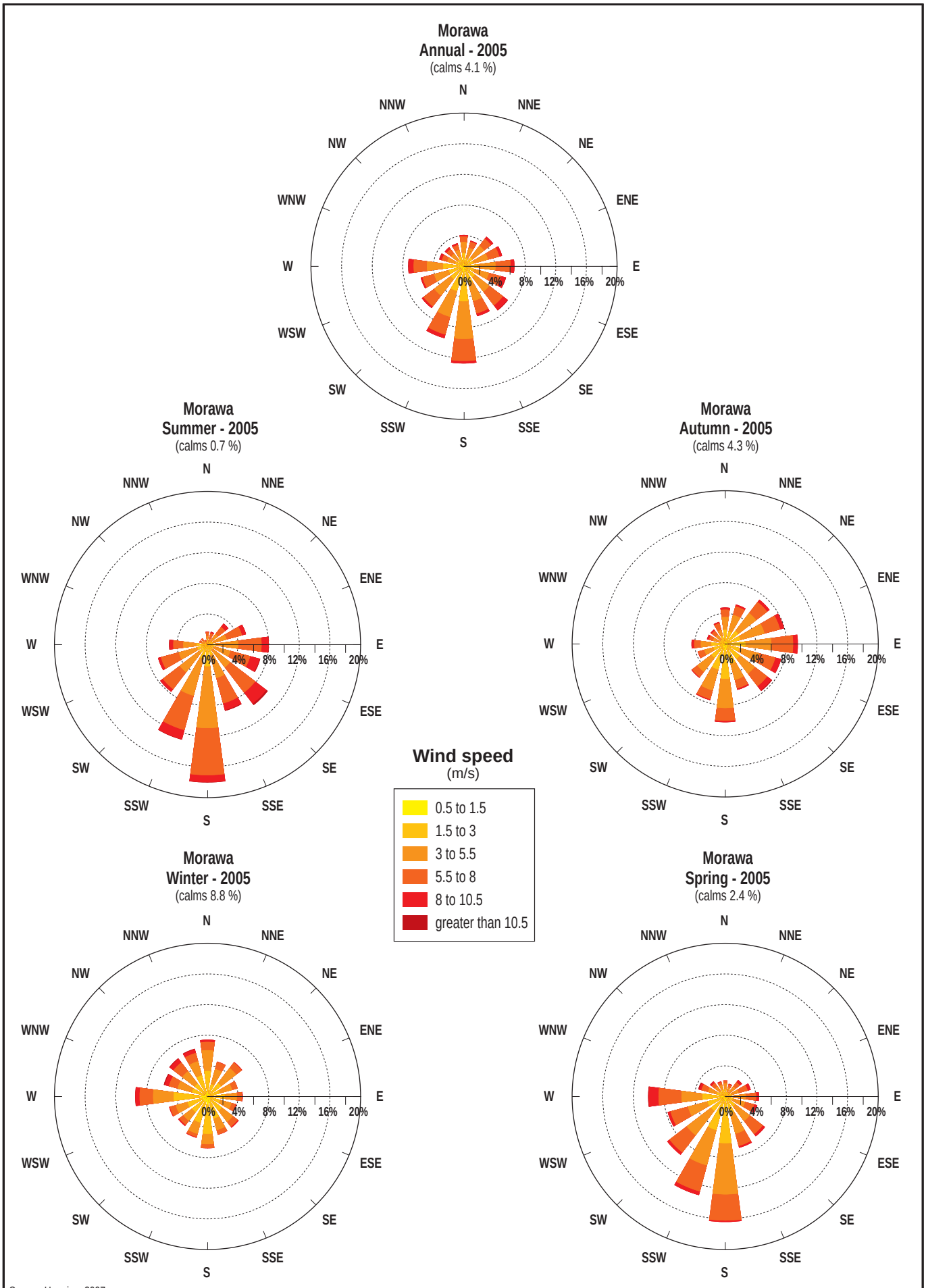
The haul road and rail siding will be sited in the western section of the northwestern Yilgarn Craton near the border with the Irwin Sub-basin. The Yilgarn Craton is distinguished by a lack of geological development since the Precambrian era (at least 500 million years ago) and is characterised by granitic, crystalline bedrock overlain with gritty clay saprolite (Department of Agriculture, 2005).

5.2.3 Flora and Fauna

The rail siding and haul road are located within the Avon botanical district, near its eastern boundary with the Austin botanical district, as mapped by Beard in 1990. The vegetation in the Avon botanical district is typified by scrub-heaths on sandplain, acacia and casuarina thickets on ironstone gravels, and eucalyptus woodlands (particularly York gum (*Eucalyptus loxophleba*), salmon gum (*E. salmonphloia*), and wandoo (*E. wandoo*)).

Under the IBRA classification system, the rail siding and western portion of the haul route will be located in the Geraldton Hills biogeographic subregion with the haul route passing through the Ancient Drainage biogeographic subregion and the Yalgoo bioregion, in which the minesite is also located.

The Geraldton Hills biogeographic subregion (part of the Geraldton Sandplains bioregion) is comprised mainly of scrub-heaths, often rich in endemic flora species, on the sandy earths of an extensive lateritic sandplain, with extensive York gum (*E. loxophleba*) and Acacia woodlands (*Acacia acuminata*) on outwash plains with associated drainage (CALM, 2002). The subregion hosts a number of threatened bird species, including Carnaby's black-cockatoo, malleefowl, painted button-quail and the peregrine falcon.



Source: Heggies, 2007

enesar	Job No: we08009	Karara Management Services Pty Ltd	**Morawa wind roses**	Figure No: **5.4**
	File No: 8009_09_F05.04_HB	Mungada Ridge Hematite Project		

The Ancient Drainage biogeographic subregion (part of the Avon Wheatbelt bioregon) is an area of active drainage dissecting the Yilgarn Craton, with vegetation similar to the Geraldton Hills biogeographic subregion. The Ancient Drainage biogeographic subregion is distinctive due to chains of salt lakes that occur as remnants of ancient drainage systems and now only fill in very wet years (CALM, 2002). Scattered granite rock pools (known as gnamma holes by local Aboriginal groups) throughout the region provide a refuge for aquatic plant and invertebrate species. Granite outcrops in the region are important as a seasonal refuge and resource for fauna from the surrounding habitats, and several species of flora and fauna are restricted to these outcrops. Fox predation is threatening many rare mammal species in the subregion.

As described in Section 5.1.3, the Yalgoo bioregion (there is no division into subregions) is characterised by low, open woodlands of Eucalyptus, Acacia and Callitris on the red sandy plains of the western Yilgarn Craton and southern Carnarvon Basin and is particularly rich in ephemeral (annual) species (CALM, 2002). The BIF ridges are a feature of this subregion and, like the granite outcrops, provide a refuge and resource for fauna from surrounding habitats, as well as habitat for a number of flora and fauna species that are restricted to these landforms.

5.2.4 Cultural Heritage and Socio-economic Environment

The rail siding will be located in the Shire of Morawa, approximately 3 km north north-east of the town of Morawa. Morawa was gazetted as a townsite in 1912; and, like Perenjori, wheat and wool growing were the main industries in the area until the 1960s. In 1966, WMC began mining iron ore at Koolanooka Hills, approximately 25 km east of Morawa. The first iron ore to be exported from Australia was from Koolanooka Hills (Shire of Morawa, 2006). Mining continued for six years, employing 114 people and shipping 5.1 Mt of iron ore to Japan from the region (Shire of Morawa, 2006).

Following closure of the Koolanooka Mine in 1972, agriculture was again the major industry of the area.

The proposed haul road passes through the Perenjori and Morawa shires and will span pastoral and agricultural areas. The heritage and current socio-economic environment of the Shire of Perenjori is discussed above in Section 5.1.4.

5.2.5 Land Use, Tenure and Conservation Significance

Current land uses in the Shire of Morawa include agriculture, mineral exploration and timber reserves. The rail siding is located on freehold property held by private landowners and the Public Transport Authority. This land is currently used for agriculture. The proposed haul road route follows existing roads.

The native title claims of the Amangu People and the Mullewa Wadjari Community overlap the rail siding area. The Widi Mob and Widi Binyardi have unregistered native title claims that cover the rail siding and the haul road.

There are no national parks or other conservation areas currently in place or planned for either the proposed rail siding or the haul road locations.

5.3 Port Facilities

5.3.1 Climate

The climate averages at the Geraldton Airport AWS indicate that the region generally experiences warm, dry summers with cooler, wetter winters. On average, summer temperatures range from a daily minimum of 15°C to a daily maximum of 30°C. In winter, average temperatures range from a daily minimum of 10°C to a daily maximum of 23°C. The average monthly summer and winter rainfalls are approximately 11 mm and 65 mm, respectively (see Figure 5.1).

As Geraldton is situated on the coast, it commonly experiences morning offshore land breezes and afternoon sea breezes, particularly in the hotter months when temperature differences between the land and sea are greatest. Average monthly wind speeds at 9.00 a.m. and 3.00 p.m. are approximately 19 km/hour and 24 km/hour respectively, although sea breezes often exceed 45 km/hour in summer (BoM, 2006). The prevailing winds at Geraldton are shown in Figure 5.5 and are summarised below:

- In summer, the dominant wind direction is from the south.
- In autumn, the dominant wind direction is from the south and the east-northeast.
- In winter, the dominant wind direction is from the east-northeast and east.
- In spring, the dominant wind direction is from the south and south-southeast.

5.3.2 Landforms, Soils and Geology

The Port of Geraldton is an operating facility, and soils and landforms have been significantly altered by historical use of this facility. The geology of this area is typical of the surrounding coastline and is dominated by limestone.

5.3.3 Flora and Fauna

No significant terrestrial flora or fauna are associated with the Port of Geraldton. The marine environment in and around the port is typified by a mosaic of subtidal sand patches and seagrass beds. The marine fauna is predominantly of southern Australian affinity but with a strong tropical influence, driven by the supply of tropical species in the Leeuwin Current (URS, 2001a). The breakwaters of Geraldton Harbour and the other marinas in the area also provide an artificial habitat for algae and a diverse marine invertebrate fauna, including rock lobsters and some corals (URS, 2001a). The outer breakwater also hosts a small (less than 20), non-breeding colony of Australian sea lions (*Neophoca cinerea*), mainly subadult males, although the occasional female is known to use the outer breakwater as a haul-out site (URS, 2001a).

As there are unlikely to be any impacts to the marine environment due to the Mungada Ridge Hematite Project, the marine environment is not discussed further in this PER.

5.3.4 Cultural Heritage and Socio-economic Environment

The port facilities are located within the Port of Geraldton, the major port for the Geraldton region. European settlement of the Geraldton region grew in the 1840s following the discovery of coal and subsequent opening of the Geraldine mine. Settlers also relocated to the region to take up pastoral leases. Geraldton has a multicultural background with British convicts arriving in the area in the 1850s, followed by Japanese and Chinese market gardeners in the 1890s, and Scandinavian fishermen in the 1900s (CoG, 2001).

The Geraldton region is the major service centre of the Mid-West Region and has a population of approximately 19,000 (ACIL Tasman, 2006). Currently, the major industries in Geraldton are retail trade, commercial fishing and tourism.

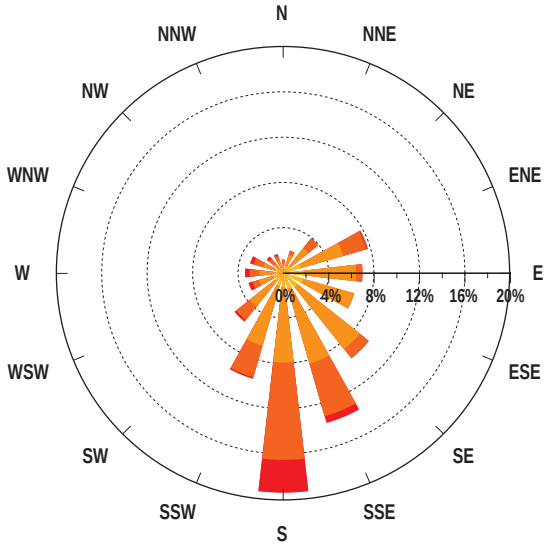
As with most cities, land use in Geraldton is primarily residential, commercial, industrial or parklands. Over half of the Port of Geraldton's exports are minerals and iron ore and the port is Australia's second largest grain export port (GPA, 2006).

5.3.5 Land Use, Tenure and Conservation Significance

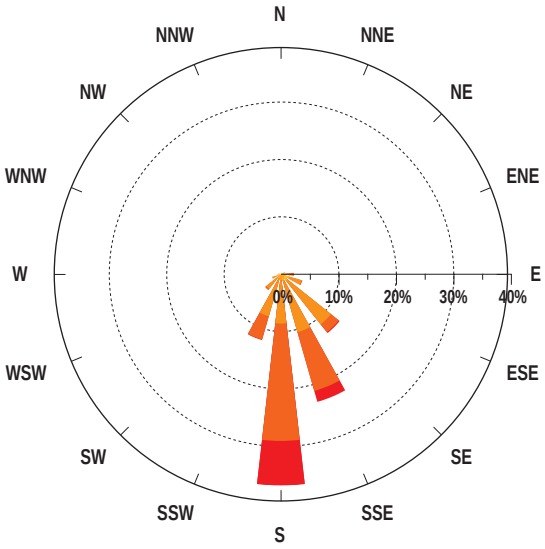
The native title claims of the Amangu People, the Mullewa Wadjari Community and the Naaguja People overlap the proposed port facilities. The relevant area of land is owned by the Geraldton Port Authority within an existing port development.

There are no national parks or other conservation areas currently in place or planned for the Port of Geraldton.

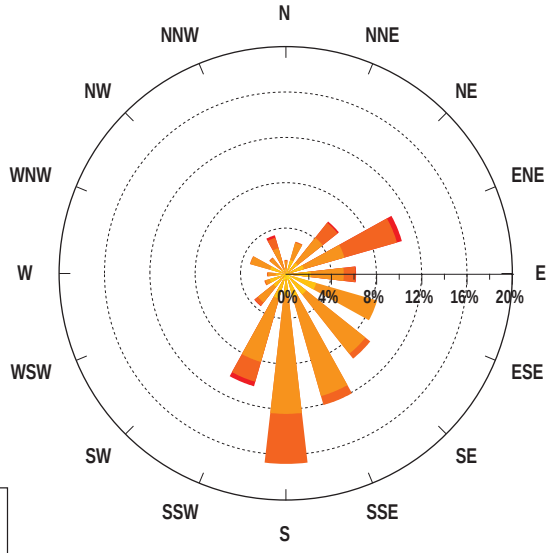
Geraldton
Annual - 2005
(calms 0.3 %)



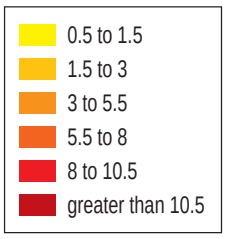
Geraldton
Summer - 2005
(calms 0.3 %)



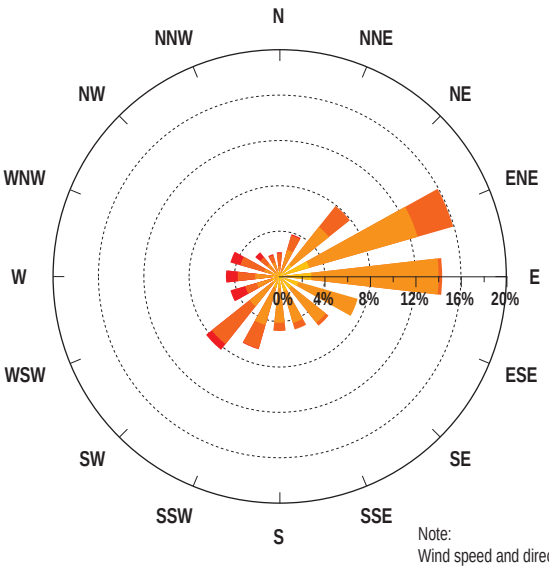
Geraldton
Autumn - 2005
(calms 0 %)



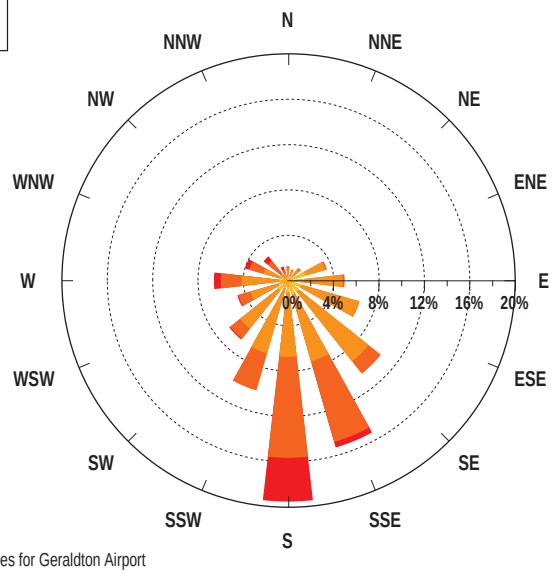
Wind speed
(m/s)



Geraldton
Winter - 2005
(calms 0.2 %)



Geraldton
Spring - 2005
(calms 0.2 %)



Note:
Wind speed and direction predicted by TAPM. Wind roses for Geraldton Airport (BoM observed data) are provided in Appendix 15 for comparison

Source: Heggies, 2007

enesar	Job No: we08009 File No: 8009_09_F05.05_HB	Karara Management Services Pty Ltd Mungada Ridge Hematite Project	**Geraldton wind roses**	Figure No: **5.5**

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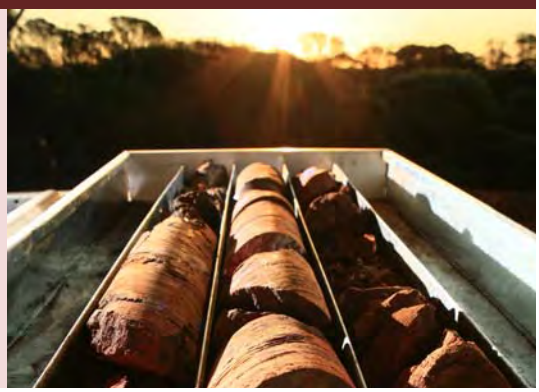
6. Project Description

- extraction and on-site processing of iron ore from new iron ore mine
- transport by road to a new rail siding near the township of Morawa
- subsequent transport by rail to the Port of Geraldton
- storage and ship loading at Port
- export by ship to international markets.



6.1 Project Overview and Location

KMS proposes to develop the Mungada Ridge Hematite Project. The proposed minesite is a greenfield site with an estimated mineral resource of approximately 22.8 Mt, with additional resources expected following further resource definition. The ore will be mined over an estimated project life of 10 years.

The project is located in the Mid-West Region of Western Australia, approximately 225 km east-southeast of Geraldton and 400 km north-northeast of Perth (Figure 6.1).

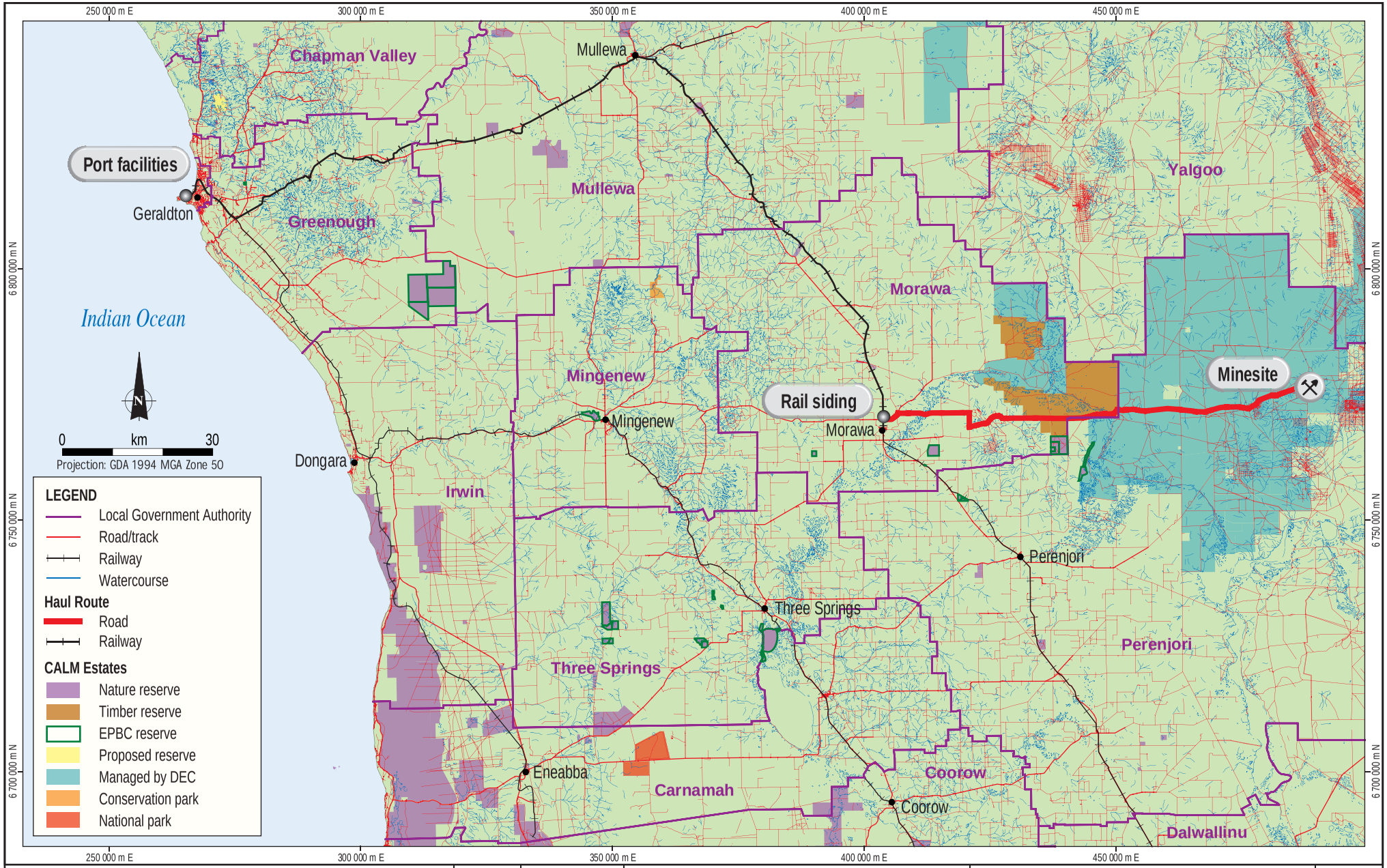
The project will involve the extraction and on-site processing of iron ore from a new iron ore mine, the transport of the ore by road from the minesite to a new rail siding near the township of Morawa, the subsequent transport by rail to the Port of Geraldton, and the storage and ship loading of the ore prior to export by ship to international markets.

The four major physical components of the project are:

- *Minesite:* Extraction and on-site processing of ore – This will require the constructing open pits, waste rock dumps and supporting services and infrastructure for the development and operation of an iron ore mine.
- *Haul road:* Transport of ore from minesite to new rail siding - This will require reinstating the previous haul road and upgrading several existing roads, to accommodate quadruple road trains. The upgrade will include realigning and sealing the existing roads to comply with operational safety requirements.
- *Rail siding:* Stockpiling and train loading of ore for transport to port - This will require the constructing a rail siding near the town of Morawa to use the existing rail WestNet Rail network. Operations will include forming the rail siding foundations, laying a rail line and constructing supporting infrastructure.
- *Port facilities:* Storage and ship loading of ore – This will require constructing an ore storage shed and will utilise the rail unloading and ship loading facilities from the Port of Geraldton.

The major features of the four components are described following Figure 6.1, Figure 6.2 and Table 6.1, which show the location of each of the project components, present a schematic process flow diagram and provide a summary of the key project characteristics, respectively.

The elements are detailed further later in this chapter.



Source: Topography - DLI, CALM Estates - DEC

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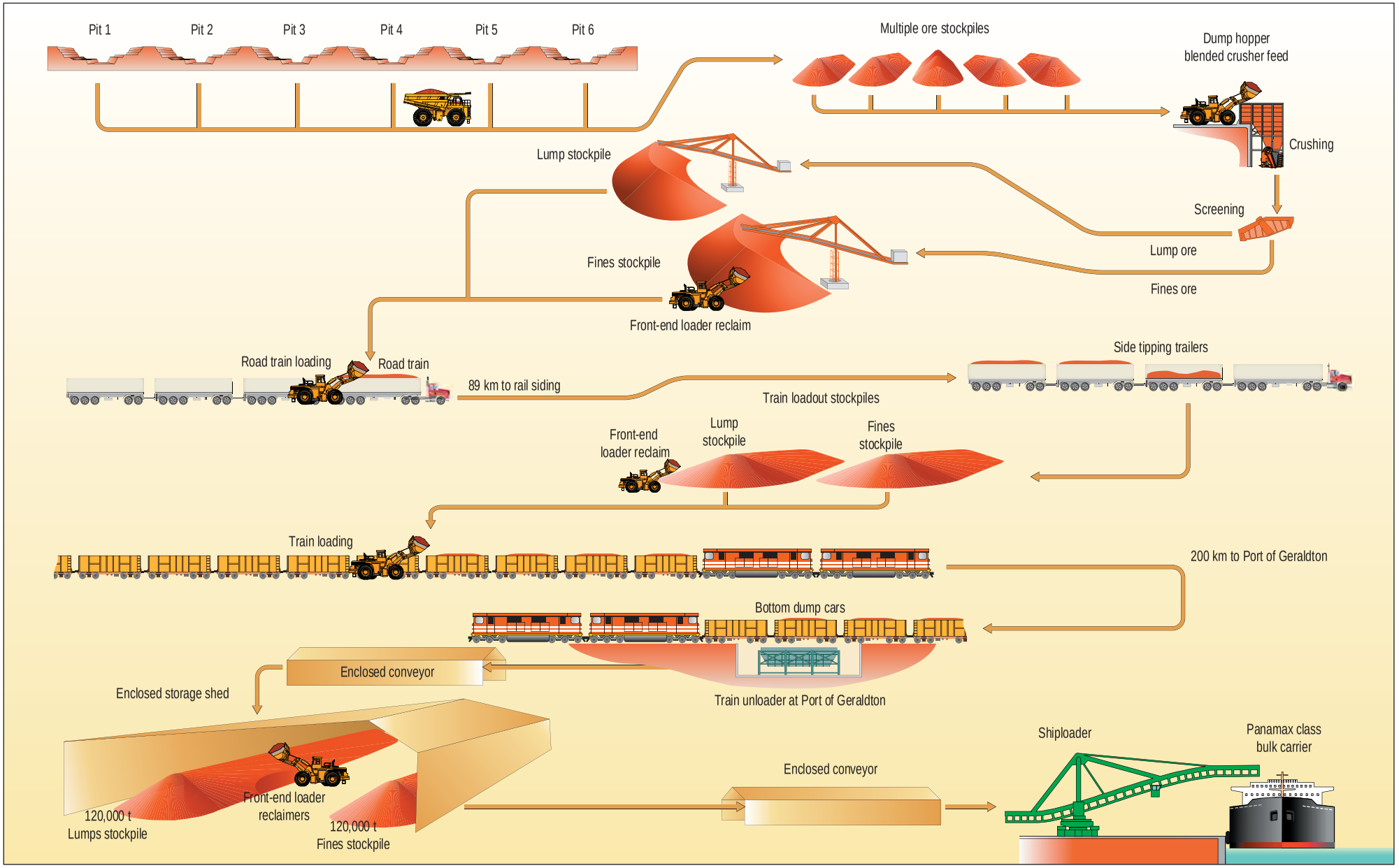
Job No: we08009	Karara Management Services Pty Ltd
File No: 8009_09_F06.01_HB	Mungada Ridge Hematite Project

Location of the project components

Figure No: **6.1**



enesar people and place	Job No: we08009	Karara Management Services Pty Ltd	**Schematic project flow diagram**	Figure No: **6.2**
	File No: 8009_09_F06.02_FT	Mungada Ridge Hematite Project		

Table 6.1 Key project characteristics		
Aspect	**Project Element**	**Detail**
General	Project life	Approximately 10 years[1]
	Resource	22.8 Mt of Hematite iron ore
	Mining rate	3 Mtpa of ore
	Timing	Construction Q4 2007 Product export 2009
	Disturbance footprint	610 ha at the minesite
		78 ha at the haul road
		60 ha at the rail siding
		No disturbance at the Port of Geraldton as existing berth facilities will be used
Mining	Extraction method	Conventional open cut mining with crushing and screening
	Number of pits	Six pits: Blue Hills North, Terrapod, Tor, Skyhook, Mungada South and Mungada South Outlier
	Ore below water table	All mining will be above the groundwater table
	Stripping ratio	Approximately 3.5:1 waste to ore
	Mineralised waste and waste rock	Approximately 10.5 Mtpa in above-ground waste dumps
Ore Transport	Haul road	Quadruple road trains will transport ore from the minesite to the rail siding
	Rail siding	Rail siding, stockpiles and support infrastructure 3 km north-northeast of the township of Morawa
	Port of Geraldton	Rail unloader, enclosed conveyors, storage shed ship loader at Berth 5
Power Requirement	Minesite	2.5 MVA supplied by diesel generators
	Rail siding	200 kVA supplied by diesel generators
	Geraldton Port	3.0 MVA via South West Interconnected System.
Supporting Infrastructure	Minesite accommodation village	Capacity for up to approximately 240 people
	Additional minesite facilities	Workshops, hardstand areas, bulk fuel storage and refueling pads, laboratory, magazine and explosive depot, wastewater and sewage treatment plants, access roads, offices
	Landfill	Putrescible waste (class II)
Water Consumption	Minesite	Dust suppression (road): 0.37 GL/a Crusher: 0.26 GL/a Potable and domestic use: 0.3 GL/a
	Haul road	Construction: 0.7 GL
	Rail siding	Construction 0.13 GL Dust suppression: 0.18 GL/a
	Geraldton Port	Dust suppression and domestic use: 0.02 GL/a
Human Resources	Workforce	Construction: approximately 200 Operation: approximately 230

[1]The project life includes the anticipated future resource definition.

6.1.1 Project Tenements

The components of the project will be located on a number of different tenements. Seven tenement applications have been lodged with the DoIR and are pending approval. The tenement number, tenement holder and status of the project tenements are provided in Table 6.2.

Table 6.2 Summary of project tenements

Tenement Type and Number	Tenement Holder	Status
Exploration		
E59/817	Lotus Minerals Ltd[2]	Granted
E59/1068	DSO Ventures Pty Ltd[2]	Granted
E59/1138	DSO Ventures Pty Ltd	Granted
Mining		
M59/649	DSO Ventures Pty Ltd	Granted
M59/650	DSO Ventures Pty Ltd	Granted
M59/7211	Lotus Minerals Ltd	Pending
General Purpose[1]		
G59/37	Lotus Minerals Ltd	Pending
G59/38	Lotus Minerals Ltd	Pending
G59/39	Lotus Minerals Ltd	Pending
Miscellaneous		
L59/103	DSO Ventures Pty Ltd	Pending
L59/104	DSO Ventures Pty Ltd	Pending
L59/105	DSO Ventures Pty Ltd	Pending

[1]General Purpose Leases G59/37 to G59/39 have been applied over part of E59/817.

[2]DSO Ventures Pty Ltd and Lotus Minerals Ltd are both wholly owned subsidiaries of Gindalbie Metals Ltd.

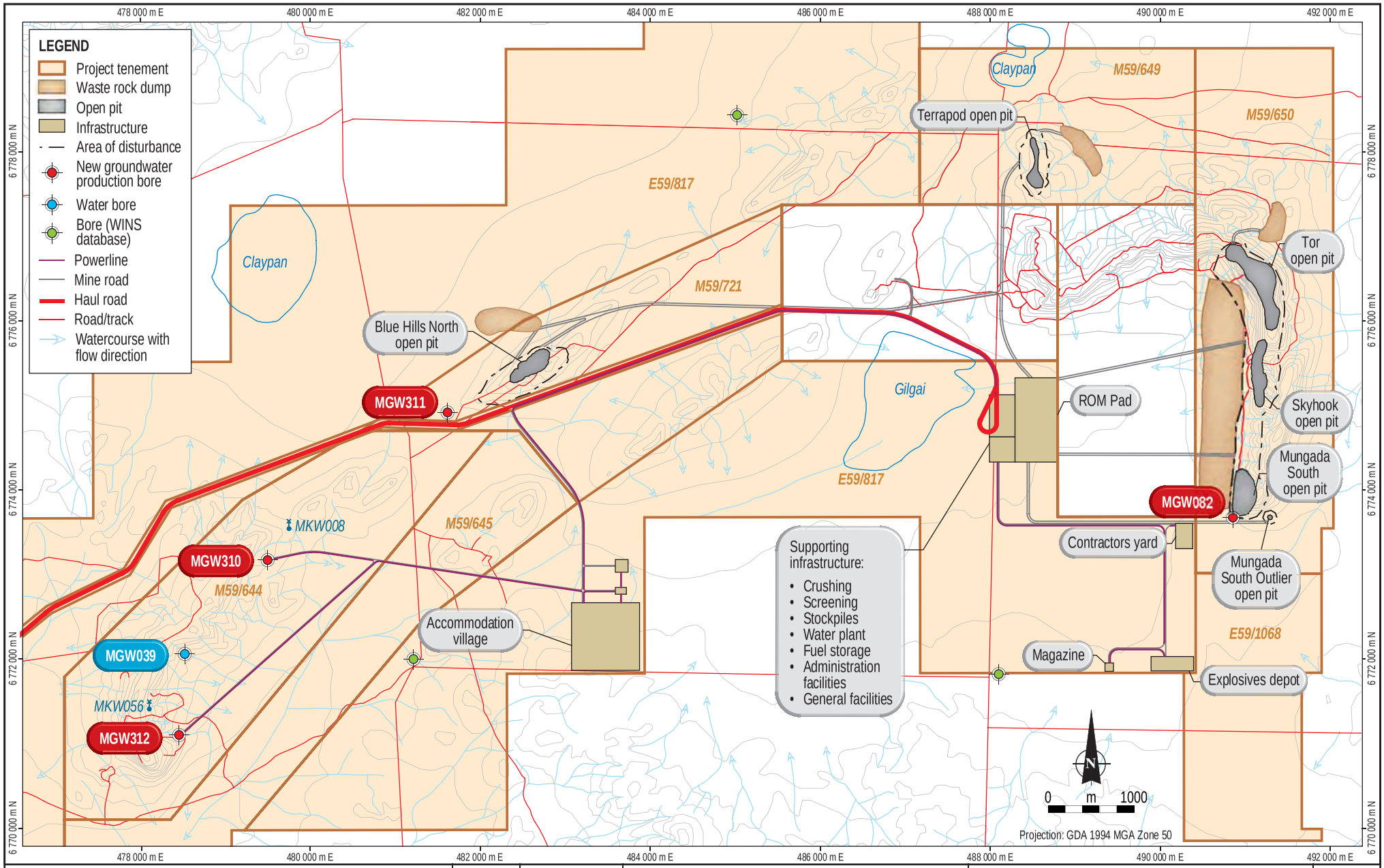
6.1.2 Minesite

Figure 6.3 shows the preferred minesite layout. However, some changes to the layout are anticipated, as a result of outcomes from investigations associated with detailed design. The minesite facilities will include:

- Six open pits (Blue Hills North, Terrapod, Tor, Skyhook, Mungada South and Mungada South Outlier).
- Four waste rock dumps (one each for Blue Hills North, Terrapod and Tor pits and a combined dump for Skyhook, Mungada South and Mungada South Outlier pits and some of the waste from Tor).
- ROM pad, crushing and screening plant, and product stockpiles.
- Minesite infrastructure, such as an accommodation village, administration buildings, workshop, fuel storage area, on-site laboratory, explosives depot and magazine, access roads, hardstand areas, contractors' yard, power supply and communication systems.
- Potable water plant and wastewater treatment facility.

The facilities at the minesite will be located on a number of different tenements. All mining activity will be undertaken within granted mining leases, whereas the support facilities (e.g., the accommodation village) will be situated within general purpose leases. Refer to Table 6.2 for a summary of the project tenements.

Further details of the minesite are provided in Section 6.6 (open pits), Section 6.7 (waste rock dumps), Section 6.8 (ore processing), and Section 6.9 (minesite infrastructure and services).



Source: Topography - DLI
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Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Minesite layout - preferred option

Figure No: **6.3**

6.1.3 Haul Road

The proposed haul road will comprise several existing roads that will be realigned and sealed to comply with operational safety requirements and Austroads (2003) Rural Roads Design publication. These roads include Mungada Road, Koolanooka Spring Road, Fallon Road, and Munckton Road.

The tenement overlaying the portion of Mungada Road from the minesite to the Shire of Morawa boundary is held by Midwest Corporation Limited (Midwest Corporation). Negotiations are currently under way between KMS and Midwest Corporation to share this section of the haul road. The remainder of the haul road, west to the rail siding, follows gazetted roads and approval from the Shire of Morawa will be sought prior to use.

Further details about the haul road are provided in Section 6.10.

6.1.4 Rail Siding and Rail Network

The rail siding, situated, near approximately 3 km north-northeast of the town of Morawa, will be used to stockpile ore and to load ore onto trains. It will require forming the rail siding foundation, laying a rail line and construction of supporting infrastructure. The rail siding facilities will include:

- Access roads.
- Rail siding line.
- Two product stockpiles.
- Crib room and ablution facilities.
- Hydrocarbon storage facility.
- Water storage tank.
- Workshop.

Access to the rail siding will be directly west of the Morawa Yalgoo Road and Munckton Road junction at 406,661 mE, 6,771,248 mN.

Applications for miscellaneous licenses L59/103, L59/104 and L59/105 (refer Table 6.2) have been submitted by KMS to cover the infrastructure at the rail siding. The existing WestNet Rail network from Morawa to Geraldton will be used to transport ore directly to the Port of Geraldton (see Figure 6.1).

Further details about the rail siding and the rail network are provided in Section 6.11.

6.1.5 Port Facilities

The Port of Geraldton is located within the City of Geraldton (see Figure 6.1). The port facilities will include:

- Rail unloader (existing).
- Product storage shed.
- Enclosed conveyor system.
- Shiploader (existing).
- Office.
- Workshop.
- Diesel storage and refuelling area.
- Crib and ablution facilities.

The Geraldton Port Authority (GPA) manages all of the port facilities and activities. KMS has a memorandum of understanding with the GPA that covers the construction of the product storage shed and conveyor system and all loading and unloading activities at the port. A land agreement and a port services agreement are under negotiation with GPA.

Further details about the port facilities are provided in Section 6.12.

6.2 Relationship with Other Projects

6.2.1 Karara Magnetite Project

The Karara Magnetite Project is also part of the joint venture arrangement with Ansteel discussed in Section 1.4. Iron ore mined from both projects will be directly exported to Ansteel's China-based steel production facilities.

KMS' Karara Magnetite Project is currently undergoing a separate assessment by the EPA (also a PER level of assessment). The project will produce 10 Mtpa of magnetite concentrate mined from one large open pit (Karara) at Mt Karara, approximately 12 km west of the Mungada Ridge Hematite Project.

The project will include the construction of a concentrator, tailings storage facility, waste rock dump, workshop, administration building, airstrip and expansion of the proposed Mungada Ridge Hematite Project accommodation village. Figure 6.4 depicts the relationship of the proposed Karara Magnetite Project to the Mungada Ridge Hematite Project.

Magnetite ore will be concentrated on site prior to being transported as slurry via a pipeline to the Port of Geraldton. It is proposed that the concentrate slurry will be dewatered at the port and then stored in a shed prior to export.

In addition, 4.1 Mt of hematite ore has been identified and will be extracted from the Karara open pit. These hematite ore bodies have given the identifiers of Karara South (3.7 Mt of ore) and Karara East (0.4 Mt of ore). Hematite ore from Karara South and Karara East will be extracted and hauled to the Hematite Project for where it will be blended with ore from other pits. The Karara South and Karara East ore will be hauled and railed along transport routes developed for the Hematite Project. This PER examines the impacts associated with transporting the ore to the Hematite Project. The Magnetite PER will consider the impacts of mining the ore from the Karara Pit Shell.

Although the Mungada Ridge Hematite Project will be independent of the Karara Magnetite Project, opportunities to share infrastructure between the two projects will be pursued.

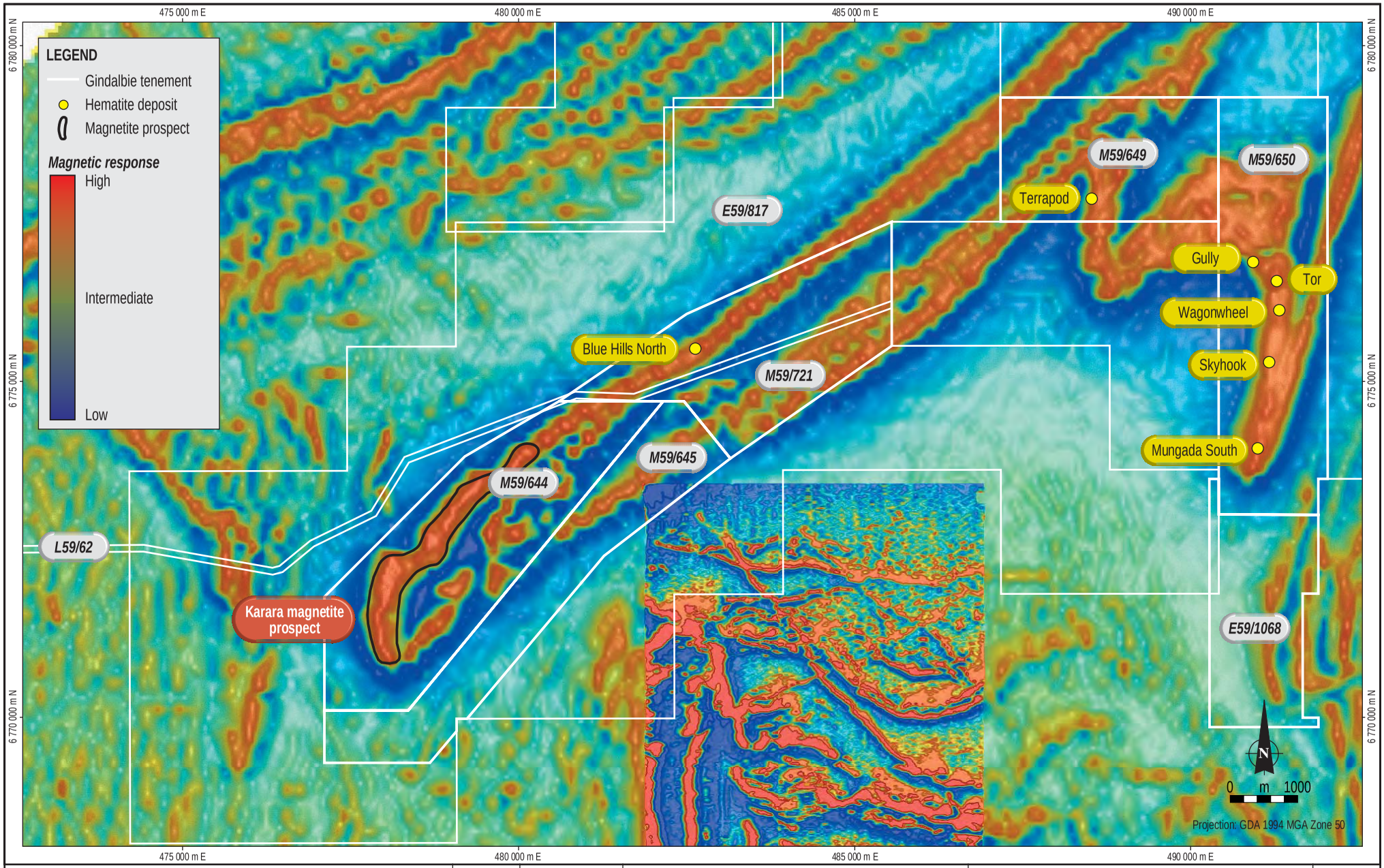
6.2.2 Blue Hills Project

Midwest Corporation's Blue Hills Project is currently undergoing assessment by the EPA (a PER level of assessment). The project involves mining hematite ore from two small pits located on the western arm of Mungada Ridge. Run-of-mine ore will be trucked to a site at Koolanooka South for crushing and screening prior to transport to the Port of Geraldton via road train and rail.

Other project components will include two waste rock dumps, access roads, a small workshop and rail siding immediately to the south of the Hematite rail siding. The feasibility of sharing the proposed haul road between the Mungada Ridge Hematite Project, the Karara Magnetite Project and the Blue Hills Project is currently being explored. The sharing of the proposed rail siding between the Blue Hills Project and the Mungada Ridge Hematite Project is also being currently assessed.

6.2.3 Extension Hill Project

Mount Gibson Iron Limited will also transport ore, from its Extension Hill Project, to overseas markets through the Port of Geraldton. Mount Gibson Iron's operations at the Port of Geraldton share a berth (Berth 5) with KMS' Hematite Project. Some of the conveyors and ship loading equipment will be shared between the KMS and Mount Gibson Iron.



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Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Relationship between the Hematite and Magnetite projects

Figure No: **6.4**

6.2.4 Geraldton Iron Ore Alliance

Gindalbie Metals Ltd (and hence KMS), Midwest Corporation, Murchison Metals Ltd, Mount Gibson Iron Limited and Golden West Resources Limited are members of the Geraldton Iron Ore Alliance. The alliance members agreed to facilitate the development of the iron ore industry in the Geraldton and Mid-West regions in accordance with objectives defined by Mr Clive Brown, Alliance chairman (Brown, 2005):

- Liaise with governments, industry groups, non-government organisations and community groups, particularly relevant departments and agencies of the Western Australian Government, the Western Australian Chamber of Minerals and Energy and the Association of Mining and Exploration Companies on key issues of infrastructure, regional development and community relations.
- Promote the development of appropriate common-user and other infrastructure, and work closely with all stakeholders in the region to optimise the utilisation of existing infrastructure.
- Work closely and cooperatively with the Geraldton Port Authority and other stakeholders to enhance the efficiency and capacity of the port.
- Liaise with community groups and stakeholders, including government agencies, to address issues arising from the expansion of the iron ore industry.

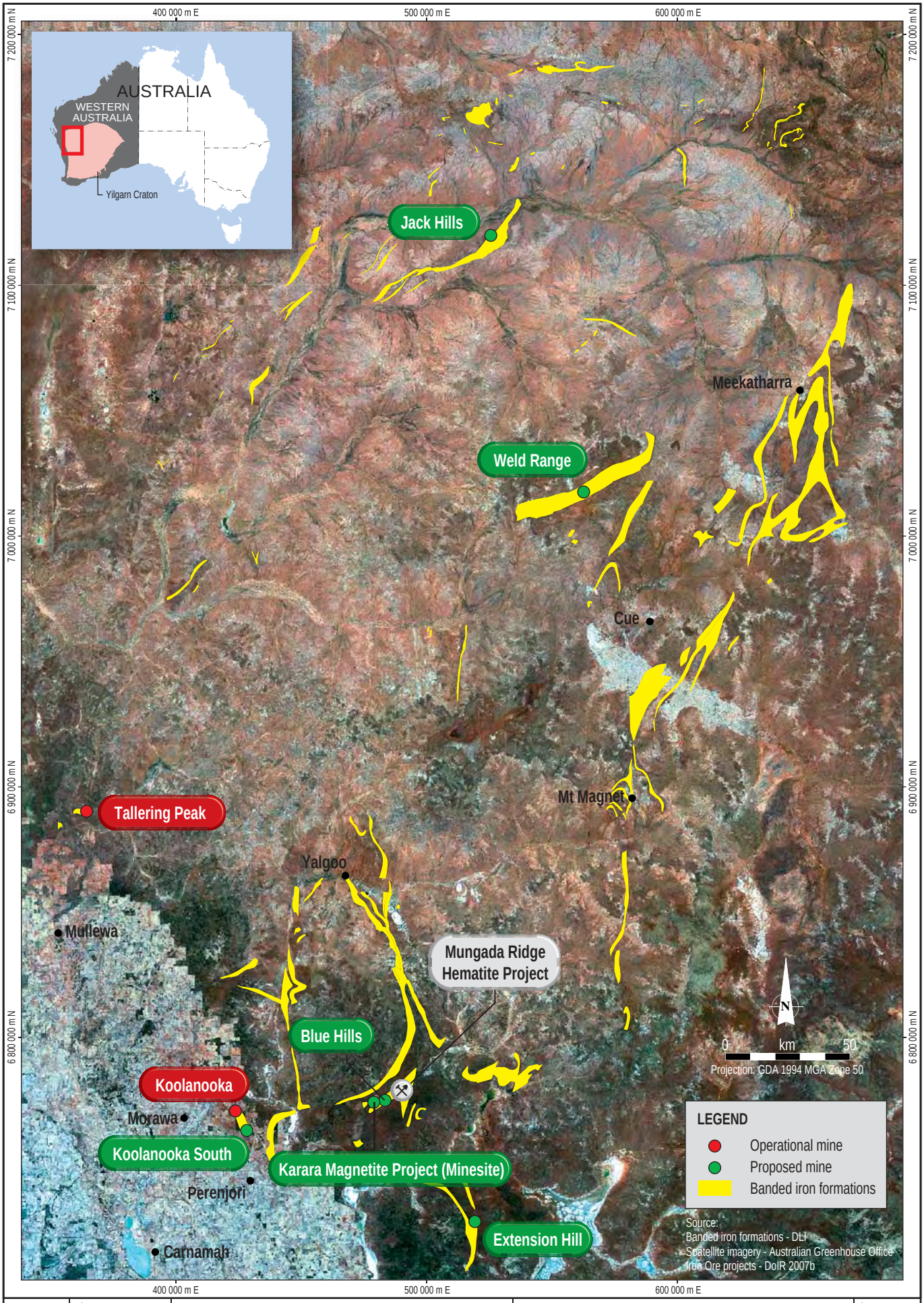
In keeping with these objectives, KMS is pursuing opportunities for infrastructure sharing with other alliance members. Table 6.3 outlines the issues considered and the outcomes.

Table 6.3 Examination of shared infrastructure opportunities

Project Aspect	Opportunity for Sharing	Stakeholders	Outcome
Railway network	Railway siding, rail network	Hematite Project Blue Hills Project	Potential shared use of railway siding.
Haul road	89-km haul road to rail siding	Magnetite Project Hematite Project Blue Hills Project	Magnetite, Hematite and Blue Hills Projects will share the haul road. All three projects will use it for minesite access, the Hematite Project will use it to access the proposed rail siding, and the Blue Hills Project may use it to transport ore to Koolanooka South.
Workforce accommodation	Accommodation village, potable water supply and waste water treatment facility	Magnetite Project Hematite Project	Facilities will be shared by both projects.
Telecommunications	Radio, phones and Internet access.	Magnetite Project Hematite Project	Facilities will be shared by both projects.
Port	Rail unloader, conveyors and ship loader	Hematite Project Mt Gibson Iron Limited	Facilities will be shared.

6.2.5 Other Iron Ore Projects within the northwestern Upper Yilgarn Craton

The project is located within the northwestern Yilgarn Craton. A number of iron ore mining operations have begun operations within the region, and others are undergoing environmental assessment. The locations of active and proposed mining operations within the Yilgarn Craton are shown in Figure 6.5.



enesar people and place	Job No: we08009 File No: 8009_09_F06.05_HB	Karara Management Services Pty Ltd Mungada Ridge Hematite Project	**Iron ore projects in the western Yilgarn Craton**	Figure No: **6.5**

6.3 Project Development Schedule

Subject to gaining all necessary approvals (discussed in Chapter 3), the project is scheduled to begin construction in early 2008. Based on the current resource estimates, the anticipated future resource definition and the proposed mining rates, mining will be completed by 2017. However, the project life may be extended if exploration identifies further resources. It is anticipated that the final site closure and rehabilitation work will be completed approximately 18 months after completion of mining. The project development schedule is provided in Figure 6.6.

A detailed mining schedule will be developed following further resource definition and modelling. The updated mining schedule will be reported in the Annual Environmental Report (see Section 8.2.1). Although the conceptual development schedule (see Figure 6.6) illustrates staggered mining of pits, backfilling of pit voids will be not undertaken. This is discussed further in Section 6 17.9.

6.4 Geology and Resources

6.4.1 Regional Geology

The Mungada Ridge Hematite Project is located in the Blue Hills Range, which falls within the Yalgoo-Singleton Archaean greenstone belt, in the Mid-West Region of Western Australia.

The iron occurrences in the project area are associated with the Windanning Formation. The Windanning Formation is comprised of jaspilitic BIF interlayered with grey to black hematite and/or magnetic-rich bands with white chert bands and reaches thicknesses of up to 1,000 m. The rock of the Windanning Formation has complex folds: however, the general structure of the area is an elongate north-northwest trending fold belt. This fold belt has been intruded in places by post-folding granites contorting and complicating the structure in the Windanning Hill area. Typically, these intrusions are oblique to the regional fold axes. Enriched hematite zones generally occur at BIF/pelite contacts, in fold closures and in cross-cutting structures. Figure 6.7 depicts the detailed geology within the Windanning Hill area.

6.4.2 Local Geology

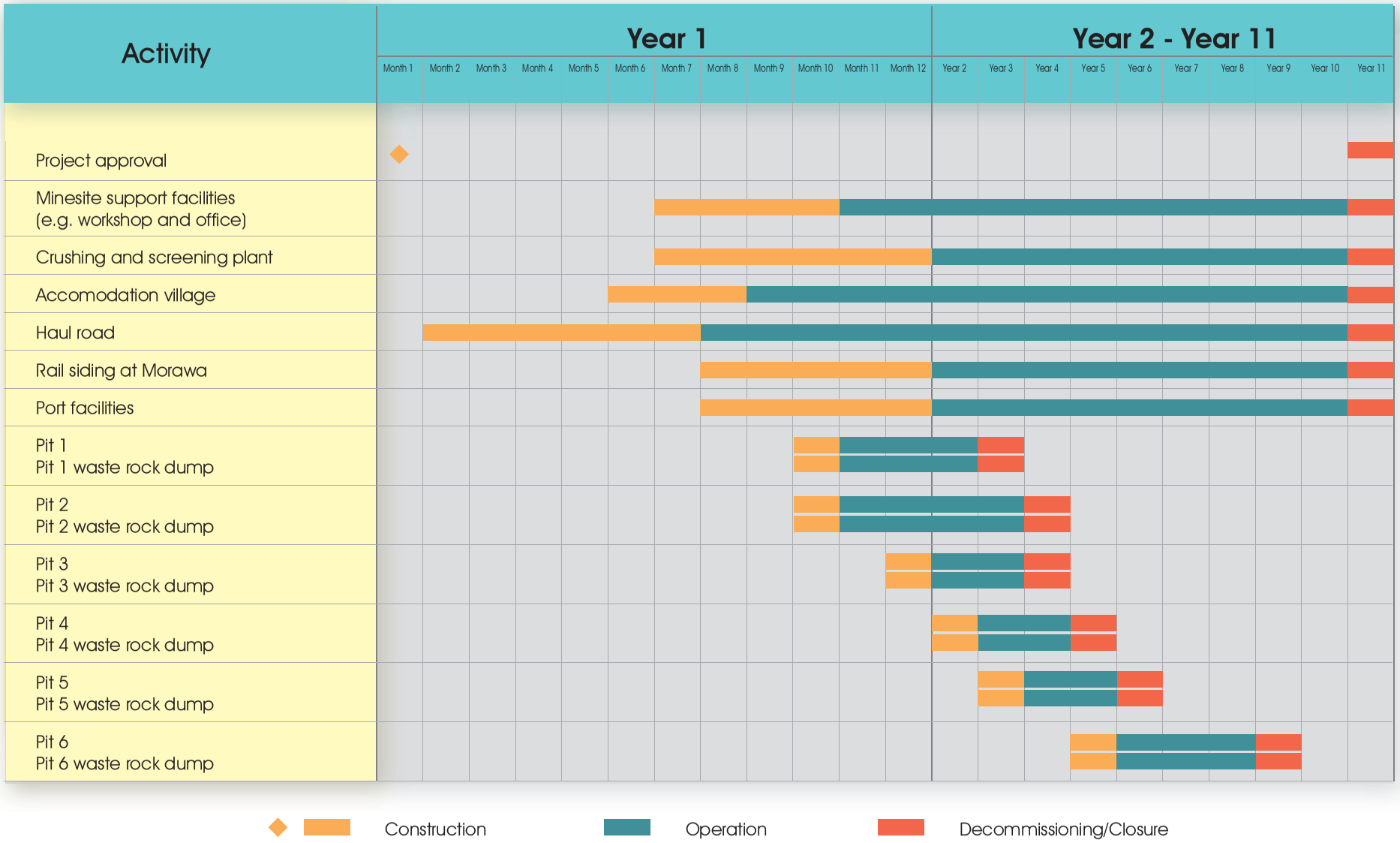
A number of styles of hematite mineralisation have been identified to date. Mapping and drilling indicate mineralisation is structurally controlled and complex. Often a zone of brecciation occurs within, and adjacent to, the mineralisation. These breccias can contain enriched BIF clasts through to mixed clasts of enriched BIF, cherty BIF and milky vein quartz. In addition, zones of quartz veining have been noted adjacent to or on the margins of hematite enrichment. Commonly, zones of enrichment and areas adjacent to these zones display an increase in grain size (Bleakley, 2006).

Deep drilling into fresh rock beneath the enriched hematite has intersected broad zones of strongly magnetic BIF and partially enriched to enriched magnetite-hematite (martite) BIF. Examples of this occur at Terrapod, Tor and Skyhook. These zones often have distinct carbonate-chlorite-sulfide alteration closely associated with them.

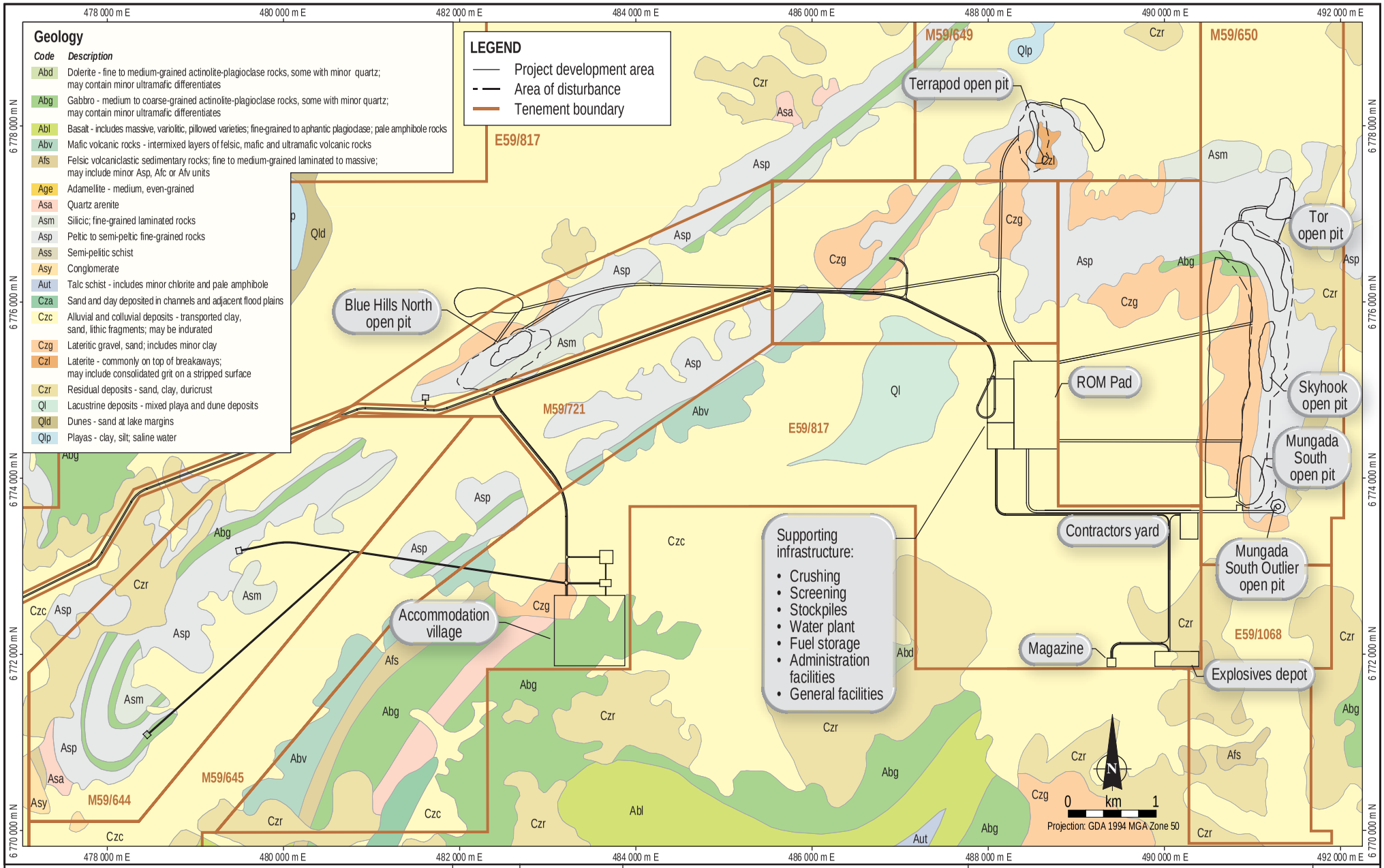
6.4.3 Resources

The extent of KMS exploration activities is depicted in Figure 6.7. These exploration activities have identified in total ten hematite ore bodies that are potentially viable for extraction and sale. These ten hematite ore bodies are:

- Blue Hills North
- Terrapod
- Tor
- Skyhook
- Mungada South
- Mungada South Outlier
- Wagonwheel
- Karara East
- Karara South
- Gully



	Job No: we08009	Karara Management Services Pty Ltd	**Project development schedule**	Figure No: **6.6**
	File No: 8009_09_F06.06_FT	Mungada Ridge Hematite Project		



Source: Geology - KMS
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Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Geology

Figure No: **6.7**

The amount of ore that these ore bodies have been estimated to yield is listed in Table 6.4. Not all of these ore bodies are being proposed for mining at this time. KMS seeks government approval to mine the following ore bodies with the development of the open pits detailed below:

Ore body		Open Pit
Blue Hills North	-	Blue Hills North
Terrapod	-	Terrapod
Gully, Wagonwheel, Tor	-	Tor
Skyhook	-	Skyhook
Mungada South	-	Mungada South
Mungada South Outlier	-	Mungada South Outlier

This PER specifically addresses the environmental aspects associated with the mining and transport of ore from the Blue Hills North, Terrapod, Tor, Skyhook, Mungada South and Mungada South Outlier open pits and transport of ore only from the Karara open pit. KMS will seek government approval for the development of the ore bodies at a later date if mining proves to be economic.

The Mungada Ridge hematite resources have been estimated and classified in accordance with the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC, 2004). The resource estimation procedures and methods were based on the criteria set out in Table 1 of JORC (2004).

The resources include grade estimates for six major variables: total iron (Fe), silicon dioxide (SiO2), aluminium oxide (Al2O3), phosphorous (P), potassium (K), and loss on ignition (LOI). Minor elements evaluated include magnesium (Mg), calcium (Ca), sodium (Na), sulphur (S), manganese (Mn), vandium (V), titanium (Ti), copper (Cu), lead (Pb) and zinc (Zn).

Detailed geological models for each individual prospect were constructed from interpretation of geological mapping, drill-hole lithology, geochemical data and aeromagnetic data. Table 6.4 shows a calculated total resource of 22.8 Mt at 61.6% iron.

Table 6.4 Total ore resources to date

Prospect	Volume ('000 m^3)	Density (t/m^3)	Tonnes ('000)	Fe (%)	SiO_2 (%)	Al_2O_3 (%)	P (%)	S (%)	LOI (%)
Blue Hills North	1,286	3.56	4,586	62.3	5.9	1.2	0.112	0.025	1.1
Skyhook	921	3.29	3,029	61.4	6.7	1.51	0.074	0.038	2.8
Wagonwheel*	827	3.24	2,681	61.3	7.3	3.4	0.048	0.042	3.0
Karara South^	127	3.01	382	60.9	6.2	1.81	0.147	0.150	3.8
Karara East^	152	2.77	422	60.7	6.5	1.8	0.051	0.042	5.2
Mungada South and Mungada South Outlier	430.5	3.7	1,573.6	63.0	3.8	1.4	0.14	0.05	3.3
Gully*	341	3.89	1,328	60.0	4.7	1.31	0.277	0.228	5.1
Terrapod	453	2.75	1,247	62.0	5.5	2.9	0.069	0.046	5.3
Terrapod West^	1,407	2.70	3,797	61.3	5.1	4.4	0.047	0.410	5.6
Tor	984	3.77	3,712	63.2	7.2	1.0	0.074	0.026	1.6
Total /Average	**6,928.5**	**3.268**	**22,757.6**	**61.61**	**5.89**	**2.073**	**0.104**	**0.106**	**3.68**

* Gully and Wagonwheel prospects are part of the Tor open pit shown on Figure 6.3.

^The following hematite ore prospects have been evaluated from exploration activities, but KMS do not intend to develop the Karara East, Karara South and Terrapod West prospects within the hematite project scope. KMS will undergo a separate approvals process if a decision is reached to mine these resources.

6.4.4 Exploration

The intent of the 2006 hematite exploration program was to delineate between 10 and 15 Mt of greater than 57% iron-hematite resources from prospects and targets along the southern 20 km section of BIF. The hematite exploration program will continue resource-definition drilling in the southern section and begin exploration over the remainder of the 40 km of BIF with the aim of identifying new areas of hematite mineralisation. Figure 6.8 is a magnetic image depicting prospectivity within Gindalbie's tenements.

Planned exploration activities will consist of geological mapping and ground geophysics followed by resource definition drilling over identified mineralisation and phased drilling over the strike extensions of the deposits.

6.5 Characterisation of Mined Materials

In addition to direct shipping ore, mining activities will produce four other types of materials that will require specific management in accordance with their geochemical and physical characteristics, namely:

- Soil.
- Waste regolith (weathered materials).
- Waste bedrock (fresh, unweathered materials).
- Mineralised waste.

6.5.1 Geochemical Characterisation

Graeme Campbell and Associates Pty Ltd (GCA) was commissioned to carry out the geochemical characterisation of the materials to be mined by the project. A primary objective of the study was to identify materials that are potentially acid forming (PAF) and to detail appropriate management measures.

The study was greatly aided by the fact that the project's exploration program includes routine assaying for total sulfur from all drill holes at 1-m intervals. This allowed targeted selection of samples for the study and will support block modelling for quantification of PAF waste volumes.

The findings of the geochemical characterisation study are discussed below for each material type. GCA's full report is presented in Appendix 2.

Soil

GCA tested two samples of topsoil and reports that they were devoid of sulfide and carbonate minerals. The topsoil is thus classified as non-acid forming (NAF) and is therefore suitable for use in the revegetation of the outer faces of the waste rock dumps and elsewhere. These findings are in agreement with those of Landloch in Appendix 1.

Characterisation and management of topsoil and subsoil is further discussed in Sections 6.16 and 7.1.

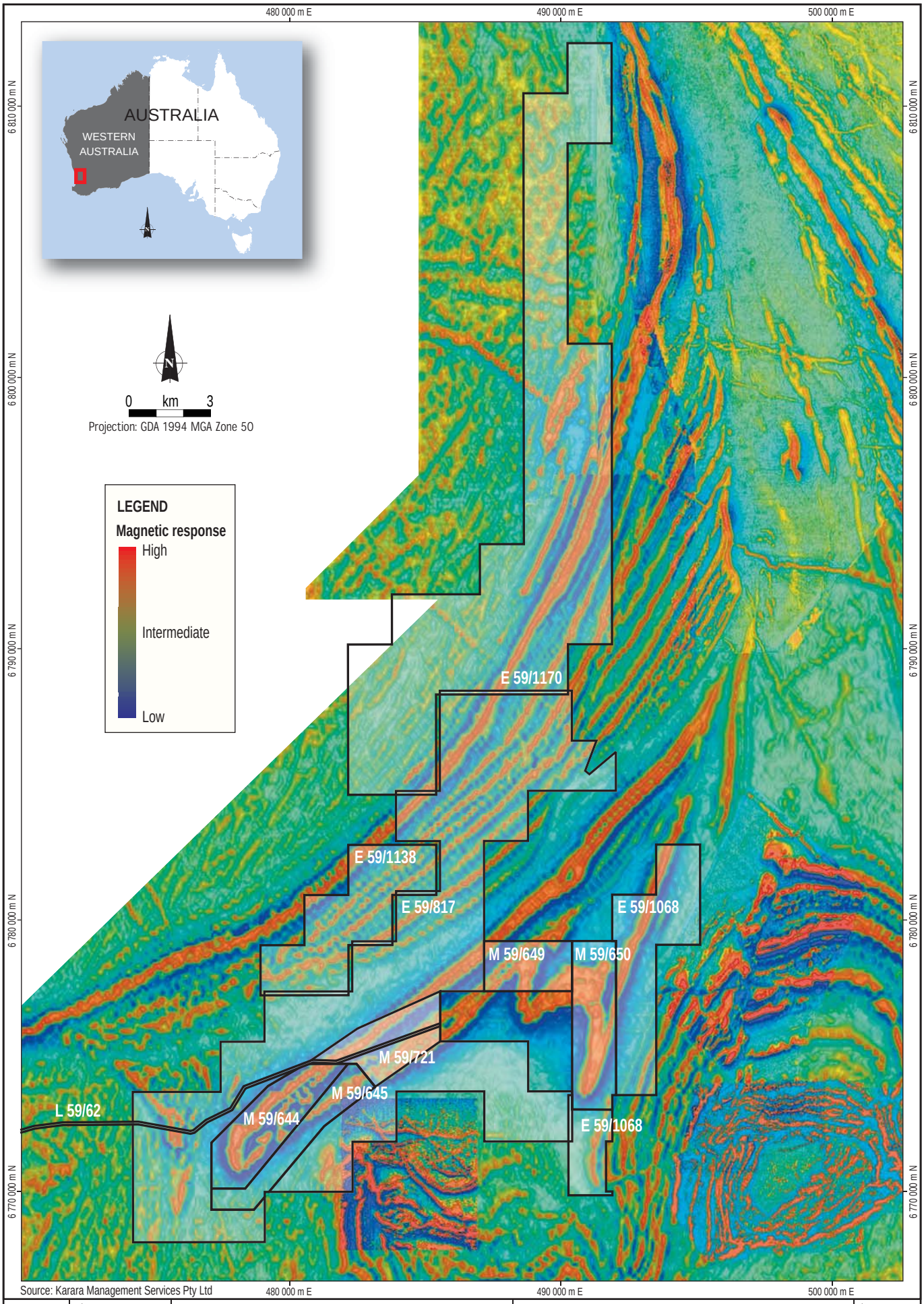
Waste Regolith

The waste regolith units are defined as:

- Ferruginous duricrust.
- Ferruginised saprolite (clay zone).
- Saprolite (clay zone).
- Ferruginised saprock.

In general, the regolith materials contain little or no sulfides or carbonate minerals. The materials are classified as NAF and thus will not pose concern for acid formation through sulfide oxidation. These regolith units are also expected to have pH and salinity regimes consistent with acceptable runoff water quality and plant growth; hence, these materials are suitable for rooting zone media for native vegetation endemic to the minesite.

Significant quantities of potentially acid forming material have been identified to reside within the Blue Hills North, Terrapod, Tor, and Skyhook pits. The composition of the regolith samples from these pits will be closely monitored to ensure that any material that could potentially be classified as PAF is encapsulated.



Source: Karara Management Services Pty Ltd

enesar	Job No: we08009	Karara Management Services Pty Ltd	Magnetic image depicting prospectivity within Gindalbie's tenements	Figure No: 6.8
	File No: 8009_09_F06.08_HB	Mungada Ridge Hematite Project		

The graphitic and pyritic shale units within the saprolite are typically acidic and saline, which is a reflection of in situ weathering. All samples of this unit are classified as PAF. This material type will need to be isolated from water to avoid oxidation and solute mobilisation. GCA found that a portion of this material type can be expected to be acidic ex-pit (i.e., as soon as it is mined), which heightens the requirement for selective handling and management.

The ferruginous saprock will also need to be selectively managed since it may be PAF locally, notably where it adjoins carbonaceous varieties of the shale regolith units and is likely to be mined as a mixture. It is understood that these regolith types are readily visually identifiable at the time of mining due to their carbonaceous nature, which will assist in identification and management.

The management of reactive (i.e., PAF) waste rock, which includes reactive waste regolith and reactive waste bedrock, is discussed further in Section 6.7.2. The NAF regolith materials, particularly the benign shale units within the saprolite, will be an important medium for use in encapsulating PAF materials.

Waste Bedrock

Apart from localised occurrences of sulfides, the BIF and shale waste bedrocks are typically characterised by total sulfur values less than 0.1%. These materials have poor circum-neutral-buffering properties due to the general absence of carbonate minerals. Hence, the majority of these materials are classified as NAF.

Samples of waste bedrock with elevated sulfur content, indicating the presence of sulfide minerals, were tested so that the geochemical nature of the sulfide-bearing lithotypes could be assessed. These lithotypes include pyritic BIF, pyritic BIF/shale and graphitic pyritic shale. All samples of these lithotypes were classified as PAF, with some expected to be acidic ex-pit. GCA recommends that, due to the range in sulfide mineral content and the occurrence of highly reactive forms (i.e., sedimentary pyrite and marcasite) these lithotypes should be selectively managed.

As noted above, the majority of the BIF and the shale waste bedrock are NAF materials, which are suitable for use on the minesite in applications where the rock will be exposed over the longer term (e.g., rock armour for erosion control and construction of open pit abandonment bunds at closure). Similarly, there are no geochemical concerns with these materials for use as road base or as stemming material during blasting.

Mineralised Waste

Mineralised waste is BIF rock, which by its nature contains negligible sulfur and is hence NAF. However, small proportions of the BIF rock on the contact zones with shales and other sedimentary rocks may host elevated levels of sulfur (greater than 0.1%). These contact zones are highly visible and will be actively monitored during daily mining operations. Any mining blocks containing greater than 0.1% sulfur will be managed as PAF material.

Mineralised waste will be hospitable to plant growth (except that moisture retention capacity is likely to be low). The management of mineralised waste is discussed in Section 6.7.3.

6.5.2 Physical Characterisation

Soil

The physical characteristics of soils to be disturbed within the minesite area, and their management, are discussed in Sections 6.16 and 7.1.

Waste Regolith, Waste Bedrock and Mineralised Waste

While a complete physical characterisation of these materials is yet to be conducted and is only practicable after mining has commenced, they can be qualitatively described as presented in Table 6.5.

Table 6.5 Physical characteristics of mined materials		
Material Type	**Material Units**	**Physical Characteristics**
Waste regolith	Ferruginous duricrust	Moderately hard and moderately competent. Particle size will range from silt to large cobbles. Resistance to erosion is expected to be moderate to high. Moisture retention capacity is likely to be moderate to high.
	Ferruginised saprolite	Soft, plastic, and non-competent. Particle size will range from clay to pebbles. Resistance to erosion is expected to be low. Moisture retention capacity is likely to be moderate to high.
	Saprolite	Soft, plastic, and non-competent. Particle size will range from clay to silt. Resistance to erosion is expected to be low. Moisture retention capacity is likely to be moderate.
	Ferruginised saprock	Soft to moderately hard and non-competent. Particle size will range from clay to pebbles. Resistance to erosion is expected to be low. Moisture retention capacity is likely to be moderate to high.
Waste bedrock	BIF	Very hard, very competent, and blocky. Particle size will likely range from silty-sand to very large boulders. Resistance to erosion is expected to be high to very high. Moisture retention capacity is likely to be low.
	Shale	Hard, moderately competent, and slabby. Particle size will range from silt to large boulders. Resistance to erosion is expected to be moderate to high. Moisture retention capacity is likely to be low to moderate.
Mineralised Waste	BIF	Very hard, very competent, and blocky. Particle size will range from silty-sand to very large boulders. Resistance to erosion is expected to be high to very high. Moisture retention capacity is likely to be low to moderate.

The physical characteristics of mined materials will be an important factor in determining how and where the materials are placed in the waste dumps or used in rehabilitation. In general, materials having coarser size distributions will be more resistant to erosion but will also have lower moisture retention capacity. Finer materials will be more prone to erosion but are more likely to have higher moisture retention capacity and thus support greater vegetation productivity.

6.6 Mining

6.6.1 Mining Program

The focus of the Mungada Ridge is the open cut mining of six pits: Blue Hills North, Terrapod, Tor, Skyhook, Mungada South and Mungada South Outlier.

The iron ore reserves will be mined using conventional open pit mining methods. It is anticipated that the BIF regolith will need to be excavated via drill and blast techniques, whereas the shale regolith should be largely free digging until the saprock zone is reached. Blasting will be undertaken using ammonium nitrate/fuel oil (ANFO) and emulsion-based explosives. A stripping ratio of 3.5:1 is anticipated for all of the open pits.

It is anticipated that the average blasting frequency will be seven times per week with typically 50 to 75 holes being fired per shot, resulting in approximately 3,000 to 5,000 bench cubic metres per blast.

Normal practice will be to backfill blasthole with stemming material to contain the explosives and hence reduce noise, dust and fly rock. Surface and down-hole delays will be used to reduce the simultaneous charge weights and hence, minimise ground vibration. Non-electric signal tubes will also be used for down-hole and surface tie-ups to improve stemming performance and reduce noise and air blast.

Each blast hole drilled will be sampled and assayed in the on-site laboratory for a range of chemical properties. The results of the sample analysis will be used to mark up the material within the open pit, so the material can be excavated and stockpiled according to its specific chemistry.

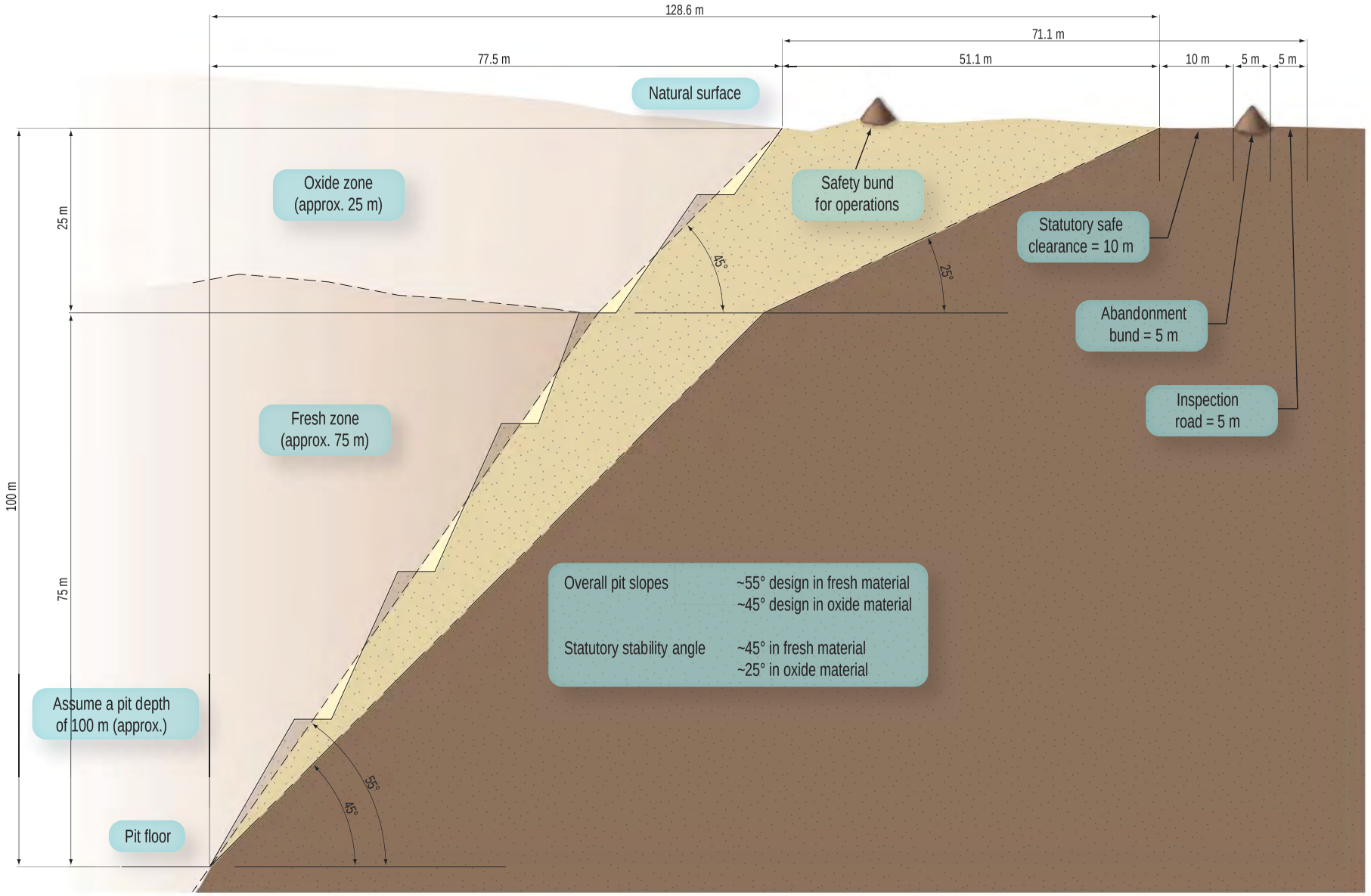
Rear-dump haul trucks will be used to haul material from the open pits to the ROM pad or to the waste rock dumps. The placement of waste rock and mineralised waste within the waste rock dumps will be determined by the material's properties to ensure PAF materials are appropriately managed.

Waste rock and mineralised waste management are discussed further in Section 6.7.

Formal geotechnical investigations are still in progress. However, based on current understanding of the local geology, it is anticipated that pit walls will be stable. For initial planning purposes, KMS has assumed a conservative pit wall angle of 55° in fresh rock and 45° in oxide material and that the statutory requirement for mine closure planning will be 45° in fresh rock and 25° in oxide material. The statutory requirement angles will be used to calculate the safe distance from the crest of an open pit for placement of the open pit abandonment bunds. A schematic of open pit wall angles and the relative location of an open pit abandonment bund are shown in Figure 6.9. The toe of the waste rock dumps will not be placed inside the open pit abandonment bund.

The final depth to which each open pit will be mined will not exceed 100 m. It is anticipated that Blue Hills North and Mungada South pits will be mined simultaneously over the first 24 months, followed progressively by a new open pit every 12 months. Figure 6.3 depicts the location of the open pits

Blue Hills North, Tor and Terrapod will each have a separate waste rock dump. While Skyhook, Mungada South and Mungada South Outlier will share one large waste rock dump to the east of the ROM pad. Some waste rock material from Tor will also contribute to the shared waste rock dump. Figure 6.3 shows the locations of the waste dumps in relation to the open pits.



Source: Thiess Pty Ltd

enesar people and place	Job No: we08009	Karara Management Services Pty Ltd	Figure No: 6.9
	File No:	Mungada Ridge He	Typical pit slope cross section

Mapping and drilling at Terrapod pit identified enriched BIF over 600 m of strike. Mineralisation over this strike length consists of three lenses separated by discontinuous narrow zones of enrichment; the most significant mineralisation is situated at the southern end of the prospect. Figure 6.10 presents geological cross-sections of both the Blue Hills North and Terrapod deposits. These cross-sections are typical of the geological structure in the area and show multiple zones of banded iron formation.

KMS does not plan to mine below the groundwater table; hence, groundwater inflow is not expected. In-pit sumps will be used to contain any incident rainfall that is collected within the open pit catchment. This water will be pumped into water carts and used for in-pit dust suppression.

During the life of the project, it is projected that approximately 22.8 Mt of ore will be mined. The initial annual ore mining rate is expected to be 1.5 Mtpa, with 3 Mtpa expected by 2009.

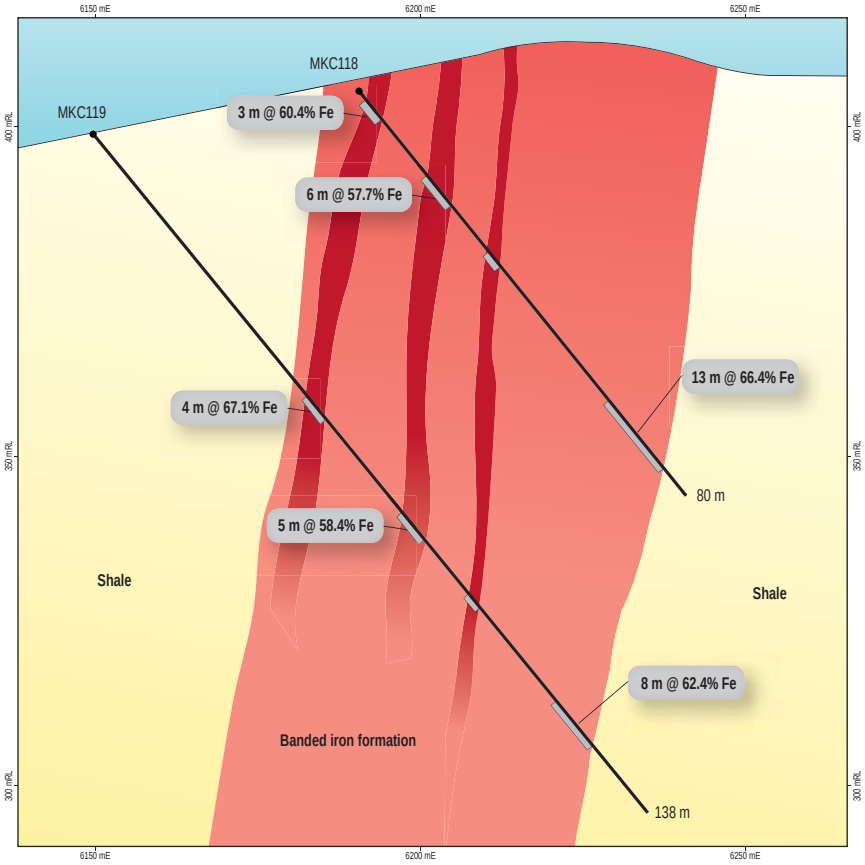
For this project, ore has been defined as having iron content greater than 57%. Material with an iron content of between 30% and 57% has been defined as mineralised waste and will be stockpiled for future blending.

6.6.2 Mining Equipment

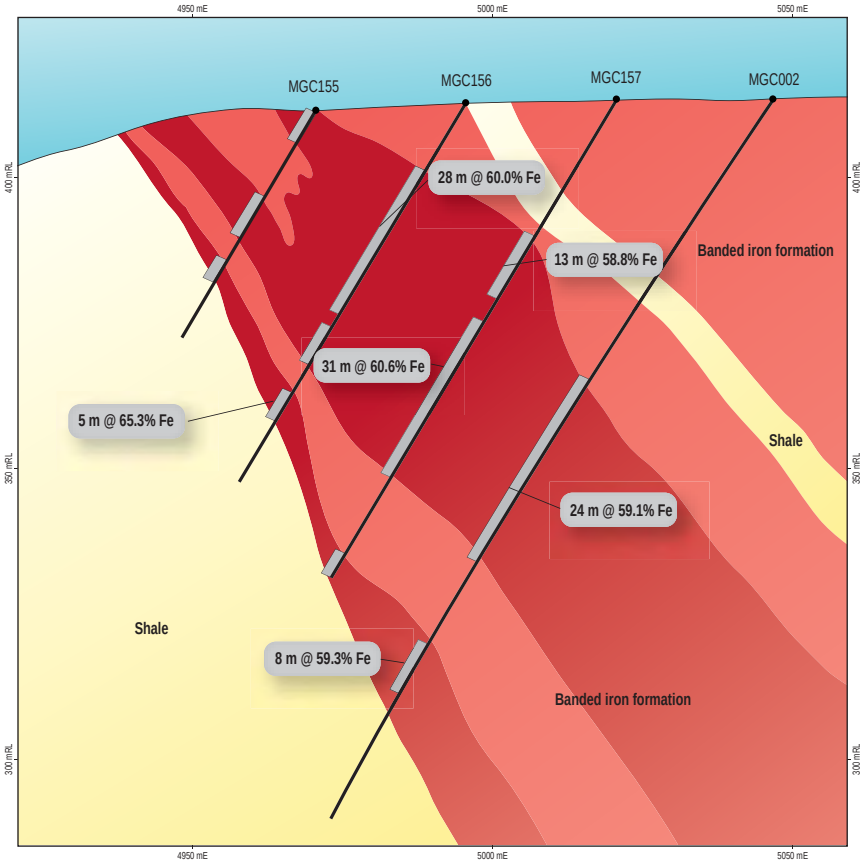
Table 6.6 provides an indication of the mining equipment required for the project. The actual composition of mining equipment will vary, depending on the mining schedule.

Table 6.6 Indicative mining equipment requirements

Equipment Item		Number
Drills	Small blast hole drill rig (89-mm to 150-mm diameter holes)	3
Loading units	120-t hydraulic excavator	3
Haul trucks	85-t capacity off-highway rear-dump haul truck	8
	106-t capacity side-tipper road train	12
Ancillary	Large front-end loader	3
	Large tracked dozer	2
	16-G sized grader	1
	50,000-L capacity off-highway water cart	2
	3,000-L capacity off-highway fuel truck	1
Miscellaneous equipment	14-t explosives truck	1
	14-t service truck	1
	20-t crane (rough terrain)	1
	Fork lift (rough terrain)	1
	2-t utility truck	1
	Light vehicle	10



Section at Blue Hills North showing multiple zones of enriched banded iron formation



Section at Terrapod showing broad zones of enrichment hosted by the basal banded iron formation unit

Legend

drill hole

iron grade

Source: Bleakley, 2006

enesar peopleandplace	Job No: we08009 File No: 8009_09_F06.10_FT	Karara Management Services Pty Ltd Mungada Ridge Hematite Project	**Geological cross sections of Blue Hills North and Terrapod**	Figure No: **6.10**

6.7 Waste Rock and Mineralised Waste Management

6.7.1 Waste Rock Dumps

An estimated 95 Mt of overburden, waste rock and mineralised waste will be mined throughout the life of the project and used to create the waste rock dumps (see Figure 6.3).

KMS has produced a preliminary design for the waste rock dumps based on the following objectives:

- Achieve a physically safe and stable landform, which is resistant to erosion and soil loss.
- Isolate reactive (PAF) waste rock in cells within the dumps to prevent acid rock drainage (further discussed in Section 6.7.2).
- Blend the landform into the natural surroundings to maximise visual screening of final mine voids from the western viewpoint.
- Replicate to the extent practicable pre-mining land systems, soil profiles and vegetation communities.

The design incorporates elements of naturally occurring concave slope profiles. A concave profile has two main benefits in comparison to more traditional terraced (benched) waste dump slopes (Landloch, 2005):

- A concave profile avoids the formation of large gullies typically associated with terraced slopes, which can require maintenance in perpetuity if berms and rock drains are to remain effective.
- Erosion rates are two to five times less than those of terraced slopes.

The existing BIF ridges in the minesite area have concave slopes as can be seen in Figure 6.11. These natural slopes are relatively stable and erode slowly over time. The natural slope gradients are closely related to the low-rainfall climate of the area and the erosion-resistant properties of the BIF material, which contributes to the high content of ironstone fragments within the local soil profiles. Section 7.1 provides further detail on land systems and soil profiles.

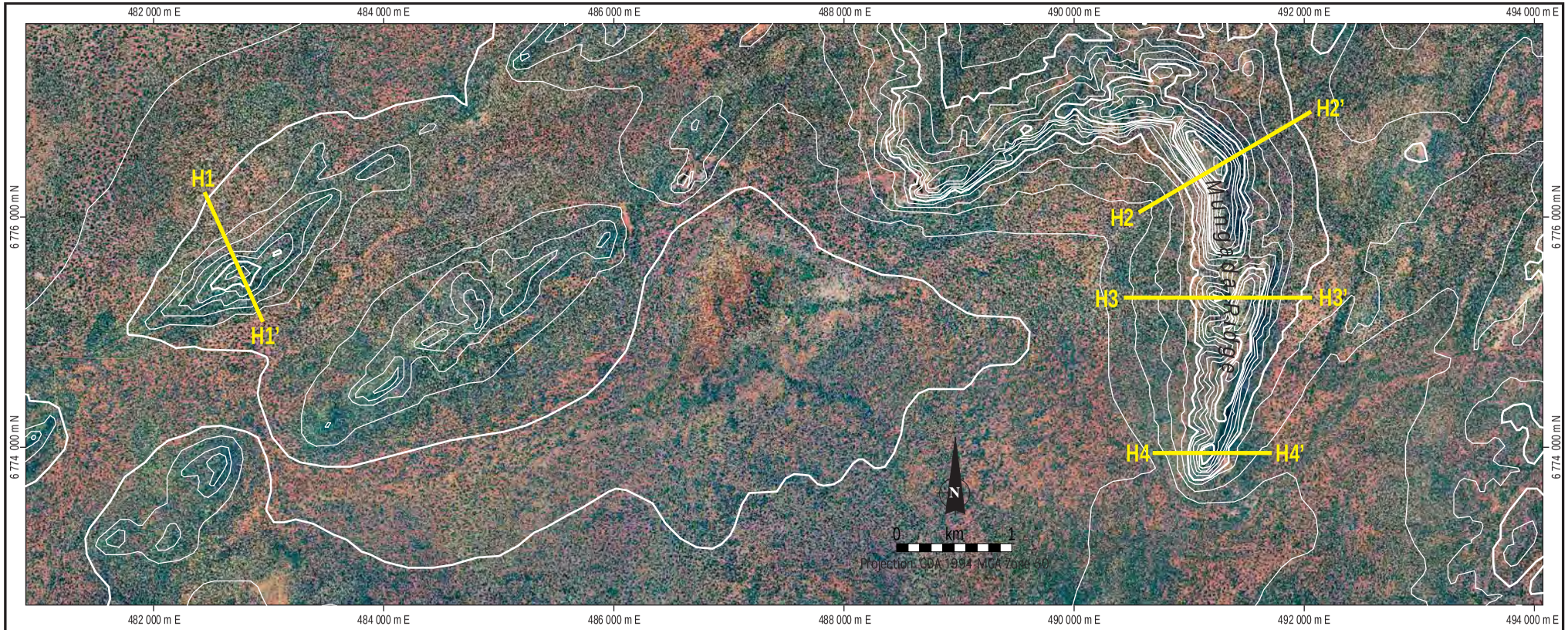
Construction of concave slopes may present some difficulties; hence, initially the waste dump will be built (dumped) in 10-m or 20-m-high levels, with berms (benches) between levels that vary between 10 m wide (for upper slopes) and 45 m wide (for lower slopes). The lower slopes of the final waste dump profile will have a slope angle of approximately 18°, and the upper slopes will have a slope angle of approximately 25 to 35°, which approximates the gradients of the existing BIF ridges. The upper slopes will remain terraced with 10-m-wide berms (benches) every 20 vertical meters for ease of construction and to maintain slope stability upon completion of the earthworks. The lower slopes will be shaped by a bulldozer into a final profile to approximate a concave slope that will mimic the natural landform profile (as per Landloch's (2005) recommendations).

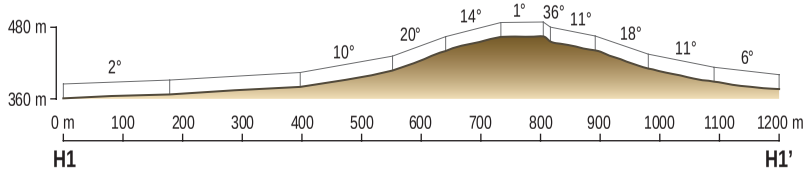
The suitability of the upper slope terracing will be further assessed with DoIR and other stakeholders during closure planning.

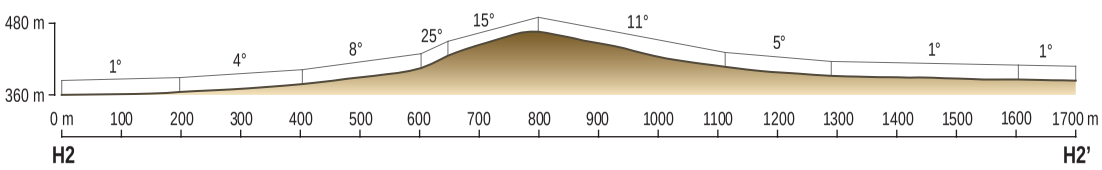
Figure 6.12 presents a schematic of the preliminary dump design with a typical cross-section through an open pit. The design of the waste rock dumps will, where practicable, minimise the footprint required for construction while attempting to resemble the shape of the existing regional landform.

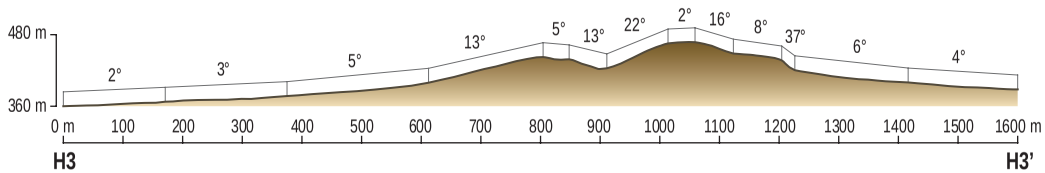
The material used to cover each section of the final profile will approximate that of the natural materials found on equivalent-gradient sections of the existing BIF ridges. That is, coarser and rockier materials will be used on the upper slopes, and finer-grained materials will be used on the lower slopes.

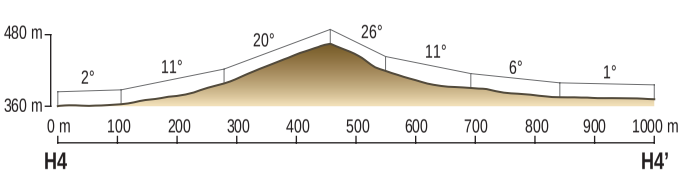
In addition to this, KMS will incorporate into its design process consideration of progressive rehabilitation of the waste rock dumps.











Source: Topography - DLI, Aerial mosaic - DLI

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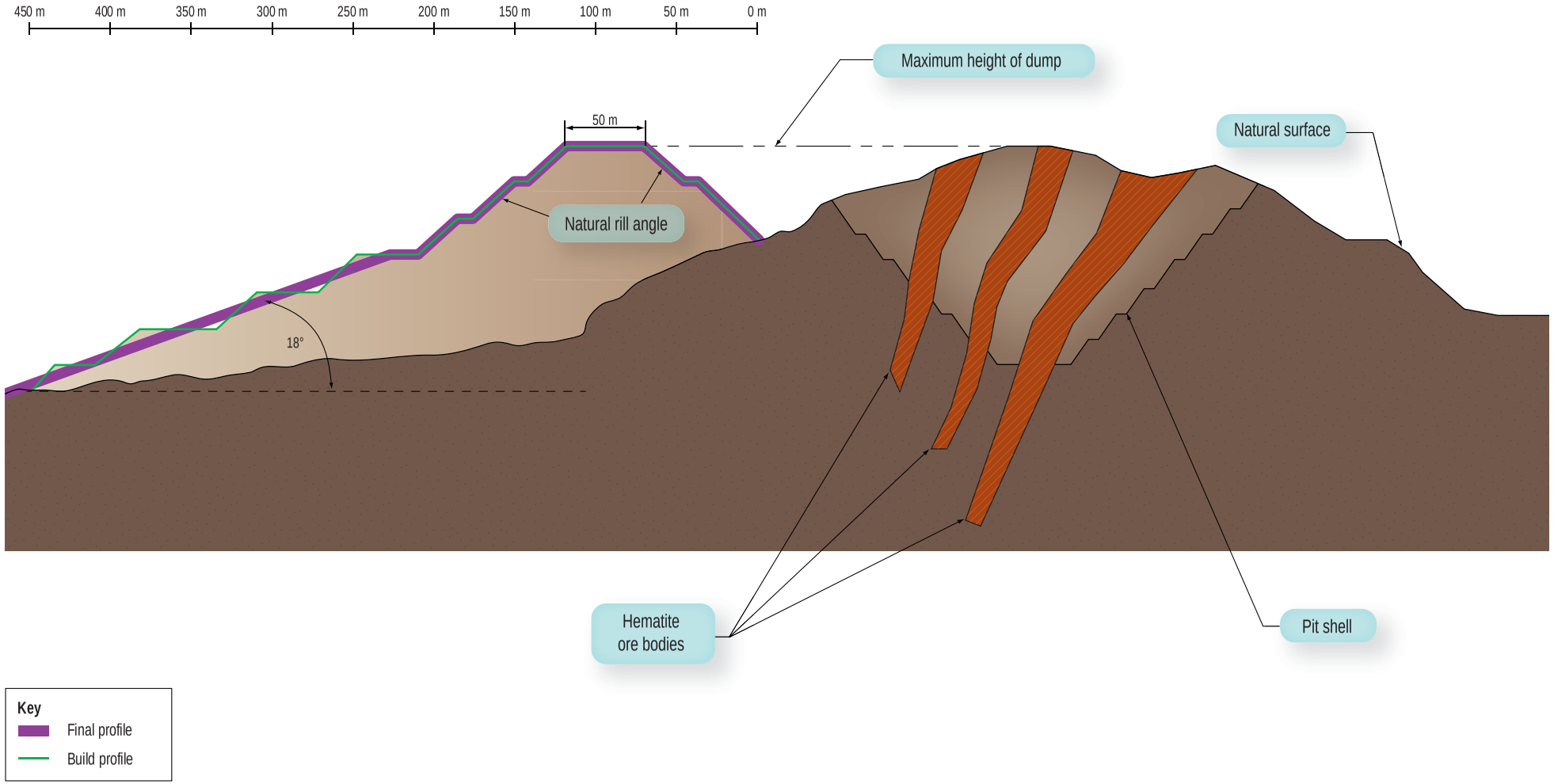
Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Natural slope heights and gradients

Figure No: **6.11**



	Job No: we08009	Karara Management Services Pty Ltd	**Typical open pit and waste dump cross section**	Figure No: **6.12**
	File No: 8009_09_F06.12_FT	Mungada Ridge Hematite Project		

6.7.2 Management of Reactive Waste Rock

Waste materials will be classified and managed according to their acid-forming potential. The sulfur content is used to classify materials as either PAF or NAF, using a total sulfur value of 0.1% as the cut-off for block modelling of reactive waste.

Table 6.7 presents estimated tonnages of PAF and NAF material. It is important to note that these estimates, derived from the geological block model, represent total sulfur values and do not distinguish between sulfides (PAF) and sulfates (mostly NAF). Consequently, the volumes of PAF material are maximum volumes.

Some isolated areas of PAF material are likely to occur at the contact zones between the BIF and regolith rock types. These contact zones are readily visible and will be monitored during daily mining operations. It is anticipated they will be limited in size and lateral extent. Further investigation will be conducted prior to project commencement to further define the quantity of PAF and NAF material types to ensure that the risk of acid rock drainage is managed appropriately. This includes a program of kinetic testing that began in June 2007.

Materials classified as PAF will be encased in appropriately designed waste rock dumps in a manner that prevents long-term exposure to air and moisture that could potentially lead to the formation of acid rock drainage. Waste rock that is classified as NAF may be safely used in waste rock dump construction to isolate PAF material.

The project is located within the arid-zone of Australia, which GCA believes significantly reduces the risk for acid formation and solute mobilisation. In this setting, sulfide oxidation is restricted to weathering windows, which are winter-rainfall driven and short lived. Restricting water supply is the first-order control strategy for the secure, long-term containment of reactive waste rock. Refer to Sections 2.3 and 2.4 of Appendix 2 for a detailed explanation of sulfide oxidation and its controlling mechanisms.

GCA has provided a conceptual design for isolation of reactive waste rock within cells in the waste rock dumps (Figure 6.13). The primary objective of the isolation cell design is to prevent infiltrating water from reaching the reactive waste rock. The four main design components are:

- Lower seepage barrier (basal blanket).
- Side walls.
- An upper seepage barrier.
- Vegetated store-and-release cover system.

The purpose of the lower seepage barrier is to retard seepage of potentially acidic pore fluids from PAF materials during major wet spells that may occur while the waste rock dumps are being constructed. Benign (NAF) weathered shale regolith will be used to construct a 1-m to 2-m-thick compacted layer. This layer will act as a sponge and will not drain unless wetted to near field capacity (i.e., near saturation).

The side walls will also be constructed of benign weathered shale but do not need to be fully engineered or rigorously compacted.

The upper seepage barrier will function as an interim protection layer while the dumps are being built and will also provide a safety factor against possible infiltration through the store-and-release cover. The upper seepage barrier will be constructed with the same materials and in the same manner as the lower seepage barrier.

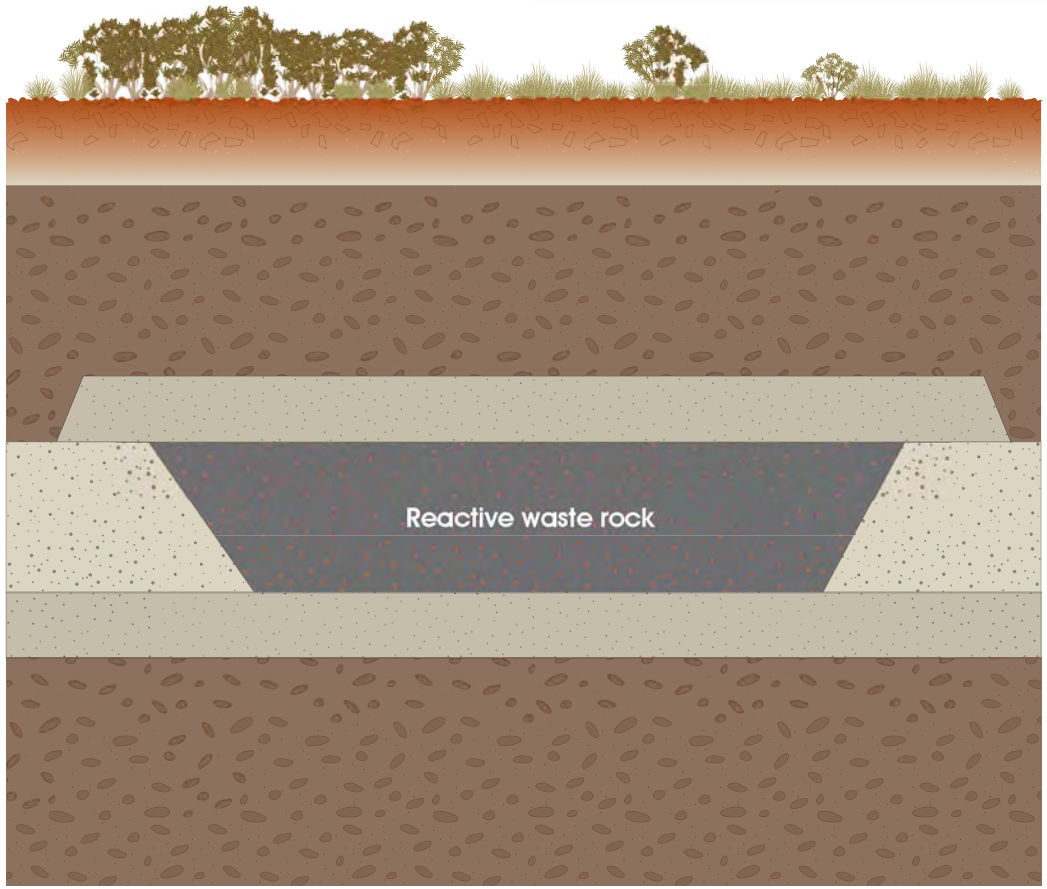
The store-and-release cover will buffer rainfall, so that the reactive waste rock is isolated from water. During the wetter winter months, the cover will absorb and store moisture, which will be slowly released through evaporation from soil and evapotranspiration by vegetation. The cover must also be erosion resistant and support vegetation. To achieve these objectives, the cover will have two zones: a rooting zone and a lower zone. The rooting zone will be comprised of topsoil ripped into stony subsoil and will be free-draining, skeletal, and non-swelling, with a total thickness of up to 1 m. The lower zone will be constructed of benign weathered shale, lightly compacted and more than 1 m thick.

Further engineering and modelling of the cover will be required to finalise the design. KMS will prepare a waste rock management plan prior to site development that includes requirements for classification of reactive waste rock.

Table 6.7 Estimated tonnages of PAF and NAF materials																		
Pit	Ore (greater than 57% Iron) ('000 t)						Mineralised Waste (30 to 57% Iron Content) ('000 t)						Waste (less than 30 % iron content) ('000 t)					
	Oxide		Transition		Fresh		Oxide		Transition		Fresh		Oxide		Transition		Fresh	
	NAF	PAF	NAF	PAF	NAF	PAF	NAF	PAF	NAF	PAF	NAF	PAF	NAF	PAF	NAF	PAF	NAF	PAF
Blue Hills North	1,052.5	0	339.5	1.0	0.9	0	2,510.9	3.9	386.2	1.3	0.2	0.1	2,201.0	0	679.2	28.8	0.1	1.2
Terrapod	415.6	1.2	26.5	0.0	0	0	1,216.3	11.3	12.3	0	0	0	601.6	23.5	12.4	0	0	0
Tor	2,069.0	91.5	588.5	53.6	0	0	6,000.1	35.5	1,401.3	46.3	0	0	1,340.3	305.5	263	23.5	0	0
Skyhook	842.9	0.0	411.3	0.3	0	0	4,864.8	0	1362.3	1.4	4.8	0	1,361.0	0	179.7	0	0	0
Mungada South and Mungada South Outlier	459.4	0.0	359.2	33.4	0	0	2,804.0	0	463.1	35.8	0	0	2,791.0	0	225.3	63.3	0	0
Total*	**4,839.3**	**92.7**	**1,724.9**	**88.3**	**0.9**	**0**	**17,396.1**	**50.8**	**3,625.3**	**84.8**	**5.1**	**0.1**	**6,907.1**	**329.0**	**1,359.6**	**115.6**	**0.1**	**1.2**

*Totals may not add exactly due to rounding.

Note: Waste materials with total sulphur content less than 0.10 % are classified as NAF, while materials containing greater than, or equal to 0.10 % total sulphur are classified as PAF. This criteria is somewhat conservative by industry standards, but is adopted at this stage in light of the low circum-neutral-buffering capacity of the waste materials and the occurrence of reactive sulphide minerals (i.e., sedimentary pyrite and marcasite).



Mulga shrubland

- characterised by open shrubland dominated by scattered eucalypts over a variety of *Acacia* species
- vegetation productivity will be seasonal with rainfall

Store-and-release system

Rooting zone

- topsoil ripped into stony subsoil
- free draining, skeletal, non-swelling
- up to 1 m thick

Lower zone

- benign, weathered shale
- greater than 1 m thick
- low-bearing-dozer compacted

Optional fill zone

- height as required
- benign waste rock fill

Upper seepage barrier

- 1 m to 2 m thick
- benign weathered shale
- compacted

Side walls

- height as required
- benign weathered shale
- low-bearing-dozer compacted

Lower seepage barrier

- 1 m to 2 m thick
- benign weathered shale
- compacted

Natural ground surface or benign waste rock fill

enesar people and place	Job No: we08009	Karara Management Services Pty Ltd	**Conceptual design of isolation cells for reactive waste rock in the arid-zone setting of the minesite**	Figure No: **6.13**
	File No: 8009_09_F06.13_FT	Mungada Ridge Hematite Project		

6.7.3 Mineralised Waste Stockpiles

Mineralised waste that has been classified as NAF will be initially utilised to form the ROM pad. Additional material will be stockpiled within the footprints of the waste rock dumps depicted in Figure 6.3.

As noted in Section 6.5.1, the majority of mineralised waste is expected to be NAF; however, small quantities of PAF material may be present, and these will be actively managed by isolation within the waste rock dumps. Thus, there are no geochemical concerns related to runoff or seepage quality that may emanate from the mineralised waste.

6.8 Ore Processing

A ROM pad will be constructed adjacent to the crushing and screening plant to stockpile ore. The location is depicted in Figure 6.3.

The operation will require accurate blending of a range of ores, sourced from different open pits, into a single product. Developing and maintaining ROM stockpiles that can be selectively recovered is the key means of ensuring that this can be accomplished. At least 0.25 Mt of ore will need to be stockpiled on the ROM pad to achieve the blending and quality specifications.

The ore will be deposited on the ROM pad by dump trucks and pushed up by front-end loaders into finger-shaped stockpiles that can be safely reclaimed. The fingers are expected to be about 250 m to 300 m long and to contain approximately 0.03 Mt of ore each.

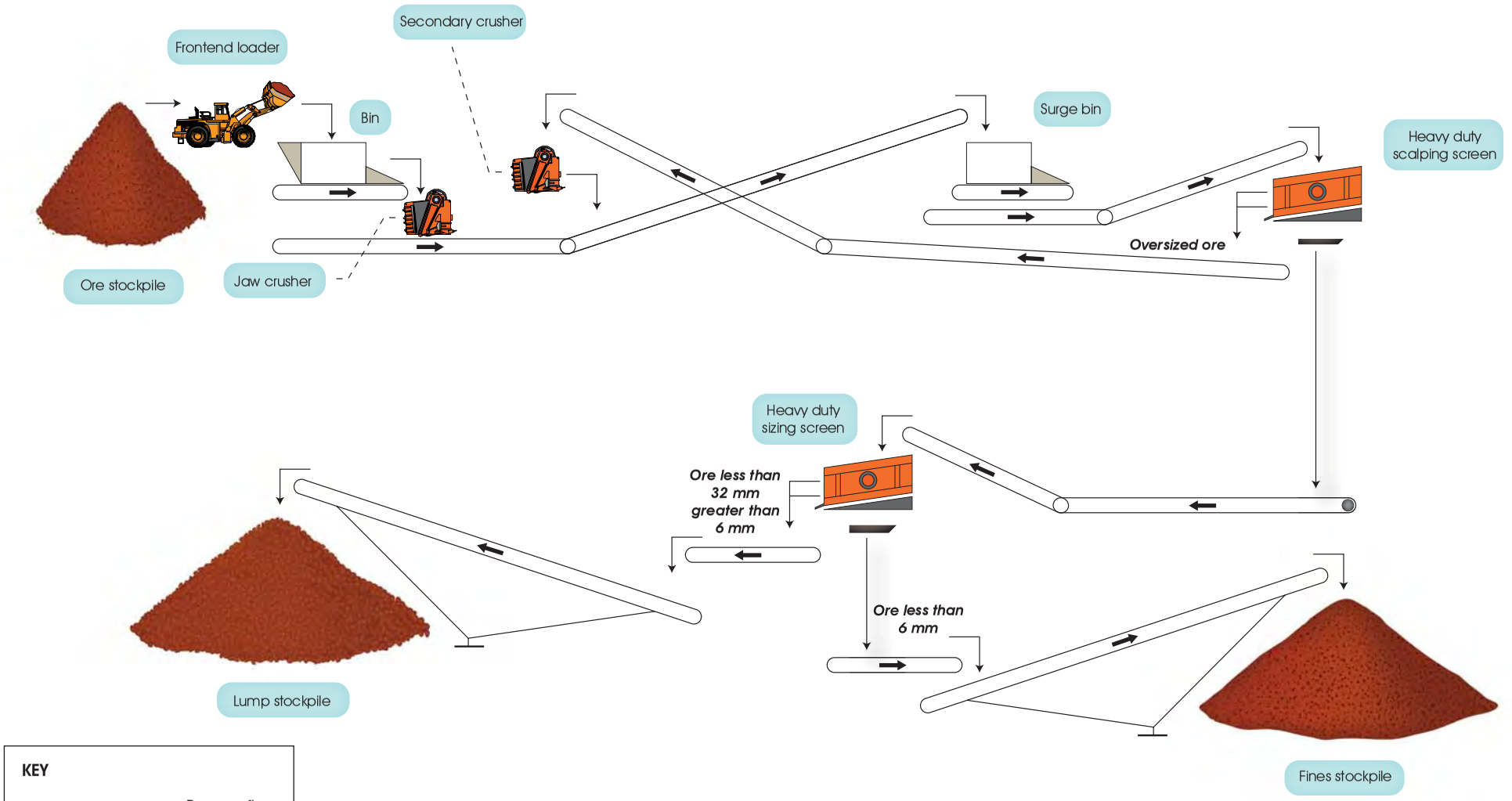
The ROM pad will be constructed in two stages to reduce initial site clearing. Allowing for loader and truck clearances between the stockpiles, access roads, haul road and clearance approaches to the crusher, the estimated footprint of the ROM pad will be 500 m by 500 m (Stage 1).

The ROM pad will only be expanded if it needs to stockpile more than 0.25 Mt to achieve the blending and quality specifications (Stage 2).

A fixed dry crushing and screening plant will be located west of the ROM pad. The plant will have the capacity to process up to 3 Mtpa, operating 24 hours per day, and will generate lump and fines product of consistent quality. The plant will incorporate dust control equipment.

Figure 6.14 presents a conceptual crushing and screening flow diagram, summarised below:

- Ore from the various ROM stockpiles will be reclaimed and fed by front-end loader into the feed bin located above the primary jaw crusher.
- The crushed material will then be directed to a heavy-duty scalping screen.
- Any oversized material will be crushed again via a secondary cone crusher.
- Appropriately sized material will be directed to a sizing screen to separate the lump (diameter 32 mm to 6 mm) and fines (diameter less than 6 mm) end product.
- Samples of the blended material will be taken on a regular basis from the conveyor belts to ensure the end product meets the product specification.
- The lump and fines product will be then be conveyed to separate lump and fines product stockpiles.
- A front-end loader will be used to load the lump and fines product into road trains for transport to the rail siding east of Morawa.



enesar people and place	Job No: we08009	Karara Management Services Pty Ltd	**Conceptual crushing and screening process flow diagram**	Figure No: **6.14**
	File No: 8009_09_F06.14_FT	Mungada Ridge Hematite Project		

6.9 Minesite Infrastructure and Services

6.9.1 Administration Building, Workshop, Refuelling, Diesel Storage and Laboratory

The administration building, workshop, refuelling area and diesel storage facility and laboratory will all be located west of the ROM pad. Ablution facilities will be constructed as part of the administration building to service personnel on the minesite (see Figure 6.3).

A heavy diesel workshop will be constructed to facilitate the repair and general maintenance of the heavy machinery fleet and light vehicles. The floor of the workshop will be designed to ensure drainage is collected in an oil/water separation system. The overflow from the oil/water separator will be directed into a bioremediation area. Hydrocarbons, including specific grease and oils required for fleet maintenance, will be stored within a bunded facility that adjoins the workshop.

The main diesel storage facility and refuelling area for mining equipment will be located in the vicinity of the workshop. The refuelling pad will be formed so that it contains a collection sump, from which any spilt hydrocarbons can be pumped to the oil/water separation system. The management of hydrocarbons and other hazardous materials is discussed further in Section 6.14.

A laboratory will be located adjacent to the crushing and screening plant. The blast hole drill samples will be analysed within the laboratory, using an X-ray fluorescence spectrometer, to ascertain a range of chemical properties. These analyses will be conducted in addition to the analyses of samples sourced from the conveyors and from the stockpiles of the blended lump and fines product. The laboratory will be include chemical storage and disposal areas and appropriately sized fume hoods.

6.9.2 Hardstand Areas

Hardstand areas will be required at the minesite for a number of purposes, including:

- Contractors' yard.
- Lay-down areas for used, reusable and new equipment.
- Light vehicle parking.
- Heavy vehicle parking.
- Storage of recyclable materials prior to removal from site.

The reuse and recyclable materials hardstand areas will be used only for the storage of inert materials that are unlikely to result in contamination of the surrounding environment. Any materials that have the potential to result in contamination, such as waste hydrocarbons, will be stored within appropriately bunded areas (see Section 6.14).

6.9.3 Accommodation Village

An accommodation village with the capacity to cater for 240 people will be located south of the Blue Hills North open pit (see Figure 6.3). The total area required is approximately 64 ha. The site has been selected taking into consideration the potential impacts resulting from noise and dust generated by mining and crushing and screening activities to personnel within the village.

Once the minesite is operational, personnel, visitors, temporary staff and contractors will be accommodated within the village. The village will include but not be limited to:

- Accommodation facilities.
- Administration facilities.
- Kitchen.
- Licensed wet mess area.
- Ablution and laundry facilities.
- Recreation facilities.

6.9.4 Wastewater Treatment

A wastewater treatment facility will be sited close to the accommodation village. This wastewater treatment will treat sewage and grey water from minesite offices, accommodation village, and workshops. The final location of this facility will be determined during detailed design.

Enviroflow Water Technologies has prepared a preliminary design for a 30 m^3/day wastewater treatment facility specific to the project. The design incorporates two separate wastewater treatment plants, one to treat grey water and the other to treat black water. All water discharged will be treated to the applicable DEH and DEC discharge criteria. The technology proposed has been approved by DEH.

The processed grey water will be used at the accommodation village to water the gardens via subterranean drippers. The drippers will be installed to avoid ponding of water on the surface. The processed black water will be disposed of within a subterranean dripper farm. This area will be fenced off to avoid accidental access.

The wastewater treatment process will produce sludge within the plant and a vacuum truck will be used as required to remove it periodically. The sludge will be treated to a standard that allows it to be classified as putrescible waste and will be disposed of within the putrescible landfill facility at the minesite (see Section 6.13.2).

6.9.5 Access Roads

Access roads are required within the operating minesite to access the open pits and other minesite infrastructure.

Conceptual access road alignments are shown in Figure 6.3. The final alignments will be designed during final project design and will be routed to best avoid impacts to significant flora and fauna species and surface drainage. The alignments of the access roads within the proposed open pit and waste rock dump footprints are likely to be modified as mining and waste rock dump construction progresses.

Water carts will be used on all unsealed access roads, on an as required basis, to control dust generation. The water will be sourced from groundwater bores at the minesite (see Section 6.9.6).

6.9.6 Water Supply

The total minesite water demand will be approximately 0.93 GL per annum (inclusive of potable water and non-potable water for dust suppression). Five bores to date have been identified as a source of minesite water (see Figure 6.3). To meet total minesite water demand additional sources of water need to be secured, these sources are still being determined. Details of the five minesite bores are provided in Table 6.8.

Table 6.8 Details of minesite bores

Bore	Easting (MGA 94)*	Northing (MGA 94)*	Yield (GL/day)	Salinity (mg/L TDS)	Water Level (mbgl)
MGW039	478,420	6,772,000	0.00012	31,000	50.5
MGW082	490,853	6,773,662	0.00013	580	24.2
MGW310	479,500	6,773,280	0.0005	9,800	46.6
MGW311	481,466	6,774,830	0.0007	81,000	12.6
MGW312	478,450	6,771,100	0.0002	1,100	30.0

Source: Rockwater (2006).
*Map Grid Australia 1994.

Approximately 0.3 GL of water per annum will be processed through a reverse osmosis water treatment plant (located near the accommodation village) for potable water supply at the accommodation village, administration building, laboratory and workshop. The saline water discharge from the reverse osmosis plant will be preferentially used as non-potable water once blended with raw water to reduce salinity levels.

The crushing plant will use approximately 0.26 GL of water per annum. Water is added to the ore to maintain optimum moisture content for crushing.

Dust suppression on minesite access roads will require 0.37 GL per annum to be sourced from the minesite bores. As the TDS content of the water ranges from 580 mg/L to 81,000 mg/L, there is the potential for impacts to roadside vegetation. Management controls will be implemented to minimise the potential impacts to flora associated with the use of saline water for dust suppression.

Figure 6.15 depicts the water balance requirement for operation of the project.

6.9.7 Power (Electricity) Supply

The total minesite power demand is estimated at 2.5 MVA. The main facilities at the minesite that require power are the crushing and screening plant, administration building, laboratory, workshop, accommodation village, contractors' yard, water bores and communication facilities.

Power will initially be generated by diesel generators located adjacent to each facility; each generator will have a diesel storage tank sited within an appropriately sized and lined earthen bund.

The size of each generator set will vary depending on the duty. The main plant area will utilise several 500-kVA generator sets including backup units to supply power to the crushing and screening plant, administration building, laboratory and workshop. The accommodation village will utilise two 500-kVA generator sets plus one back-up unit. The contractors' yard, water bores and communication facilities will each utilise appropriately sized smaller generator sets (a total of between four and six will be required).

Once the project has been established, it is planned to progressively consolidate some of the generator sets into central generating facilities and reticulate the power via overhead power lines. The power lines will utilise the same easement as the access roads thereby minimising ground disturbance.

6.9.8 Communication

A 60-m-high communication tower was installed on site in February 2007, enabling the following services to be provided at the minesite.

Telephone and Internet

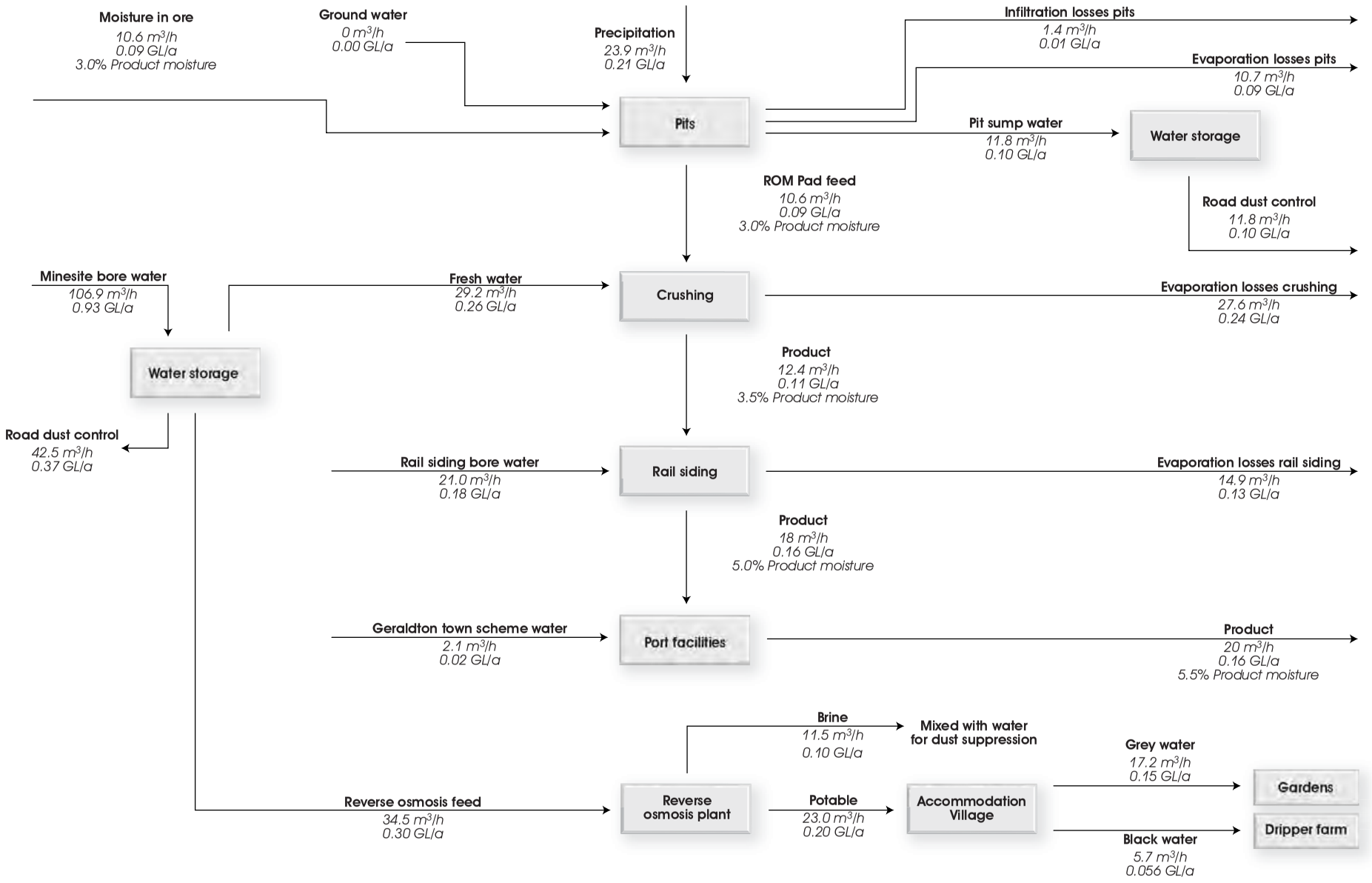
The administration building, workshops, laboratory and accommodation village will be equipped with Voice over Internet Protocol telephones, Internet and wireless intranet between offices. These systems will be land-based with fibre-optic cables connecting the operation to the existing radio-based broadband network.

Site Radio

Within the minesite, the main communication will be via site-based two-way radios. A 10-channel, two-way radio network will be required to adequately service the operation. In addition to the tower-mounted base station, trailer-mounted repeater stations will also be required to ensure adequate radio coverage across the operation. During operations, the location of the repeater stations will change as required.

6.9.9 Human Resources

It is anticipated that the majority of personnel will be employed on a fly-in, fly-out (FIFO) contract. Personnel will work a 12-hour shift on a roster of nine days on, five days off. Personnel will be flown from Perth or Geraldton directly to the existing airstrip at Morawa. Coaches will then be utilised to transport FIFO staff between the airstrip and the accommodation village located at the minesite.



Source: Promet Engineers	enesar people and place	Job No: we08009 File No: 8009_09_F06.15_FT	Karara Management Services Pty Ltd Mungada Ridge Hematite Project	**Indicative operational water balance**	Figure No: **6.15**

6.10 Haul Road

A haul road is required to transport lump and fines product from the minesite to the rail siding. The haul road, which will be approximately 89 km in length, will be developed by upgrading a number of existing roads to a standard acceptable for carrying quadruple road trains and in line with shire and Main Roads Western Australia standards and the Austroads (2003) Rural Roads Design publication. As a result of upgrades, it is anticipated that the total cleared width required along the length of the haul road will range from 15 to 20 m and includes a running surface, shoulders, drains and visibility zones.

The haul road route is as follows (Figure 6.16):

- Starts at the minesite (488,083 mE, 6,776,315 mE).
- Continues west along Mungada Road to the junction of Mungada Road and Koolanooka Spring Road (427,580 mE, 6,770,260 mN).
- Turns northwest onto Koolanooka Spring Road.
- Continues west to the junction of Koolanooka Spring Road and Fallon Road (420,900 mE, 6,768,500 mN).
- Turns north onto Fallon Road.
- Continues north to the junction of Fallon Road and Munckton Road (420,900mE, 6,771,300 mN).
- Turns west onto Munckton Road.
- Continues west along Munckton Road to the junction of Munckton Road and Morawa Yalgoo Road (406,680 mE, 6,771,290 mN).
- Continues west from this junction to the entrance of the rail siding.

6.10.1 Haul Road Construction

The majority of the haul road upgrade will occur within existing road reserves. The proposed haul road alignment is shown in Figure 6.16. The proposed road works include:

- Grubbing of the overgrown vegetation within the original road easements.
- Widening and reformation of the road surface, with a total cleared width of 15 m to 20 m as required.
- Realignment of sections of the road to enhance line of sight through corners to increase road safety.
- Sealing of the road surface.
- Construction of adequate road drainage structures.
- Installation of appropriate road signage.

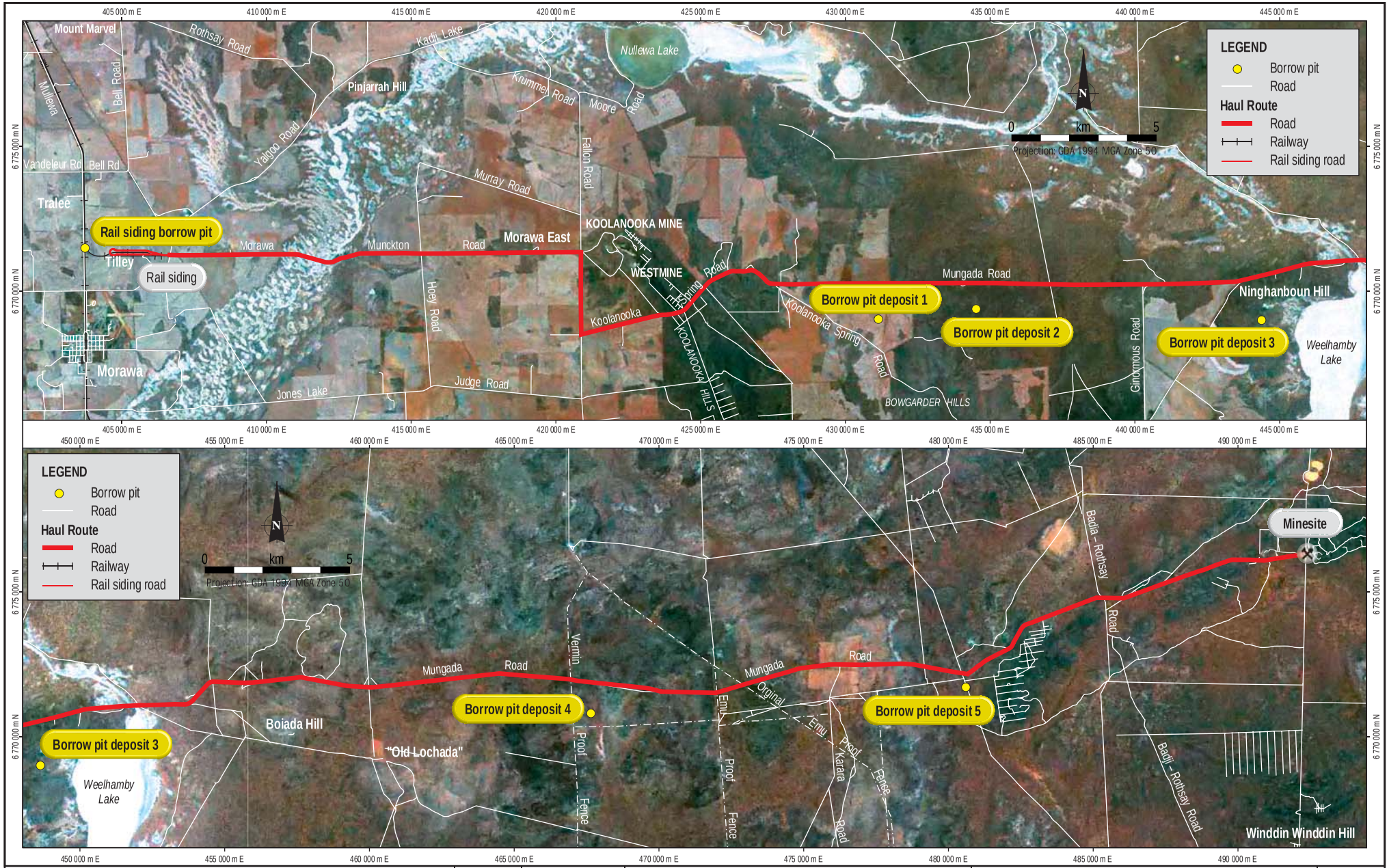
An estimated 200,000 m^3 of road base will be required to upgrade the existing roads. Suitable material has been identified within five borrow pits, located within 1.5 km of the haul road (see Figure 6.16).

GCA undertook analysis of samples from each of the borrow pits to determine the acid formation potential of each sample. These soils have all been classified as non-acid forming. Their low pH is characteristic of soils from an arid-zone environment that are heavily leached and devoid of carbonates. A summary of analysis results is provided in Table 6.9; the full analysis reports are provided in Appendix 3.

The operation and rehabilitation of borrow pits is discussed further in Section 6.16.3.

Table 6.9 Summary of the haul road borrow pit sample analysis

Sample No.	Pit Identification	pH	EC	Acid-forming Potential
GCA6542	Pit 3	5.0	0.10	Non-acid forming
GCA6543	Pit 4	5.0	0.092	Non-acid forming
GCA6544	Pit 1	4.5	0.061	Non-acid forming
GCA6545	Pit 2	5.0	0.072	Non-acid forming
GCA6546	Pit 5	5.3	0.023	Non-acid forming



Source: Topography - DLI

Job No: we08009

File No: 8009_09_F06.16_HB

Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Haul road alignment and borrow pits

Figure No: **6.16**

Approximately 0.7 GL of water will be required for surface compaction and dust suppression during haul road construction. Investigations are currently being undertaken to identify a suitable water resource. An assessment of the potential environmental impacts of abstraction from the identified resources will be conducted prior to seeking approval from DoW.

6.10.2 Haul Road Operation

The existing roads that will be upgraded for the haul road are not heavily trafficked and in general are only used by local pastoralists, exploration or mining personnel, and a small number of tourists. Throughout the duration of the project, 12 quadruple road trains, each with a 106-tonne capacity, will be used to transport ore from the minesite to the rail siding. Each of the road trains will complete seven round trips per day on a three-hour cycle time. This equates to 8,904 tonnes of ore being delivered to the rail siding daily.

Grading of the existing haul road between Blue Hills Range and Koolanooka South is the only upgrade proposed by Midwest Corporation due to the limited number of truck movements along this route. Consequently, the major portion of the upgrade and maintenance of the haul road will be undertaken by KMS.

A management procedure will be developed that addresses the safety requirements (such as speed limits, road signage and driver fatigue) and the environmental requirements (including reporting of native fauna mortalities) specific to the operation of the haul road.

6.11 Rail Siding and Rail Network

The rail siding near Morawa will be located adjacent to (and directly north of) an existing abandoned rail bed. This rail bed will be utilised to connect the siding to the existing WestNet rail network. Figure 6.17 shows the proposed rail siding layout.

Ore will be loaded onto trains at the rail siding for transport to the Port of Geraldton. The rail siding will comprise two product stockpiles, access roads, a rail siding line, hydrocarbon storage facility, a workshop, and a water storage tank. Mobile plant (i.e., front-end loaders) will be used to load the rail cars.

6.11.1 Rail Siding Construction

The area allocated for the construction of the rail siding including stockpiles and infrastructure is approximately 2,000 m long by 300 m wide (60 ha). Approximately 10,000 m^3 of road-base material will be required for the construction of the rail spur formation. This material will be sourced from within the rail siding area. However, if insufficient material of suitable quality is available at the siding site, additional material will be sourced from borrow pit 1 located along the haul road.

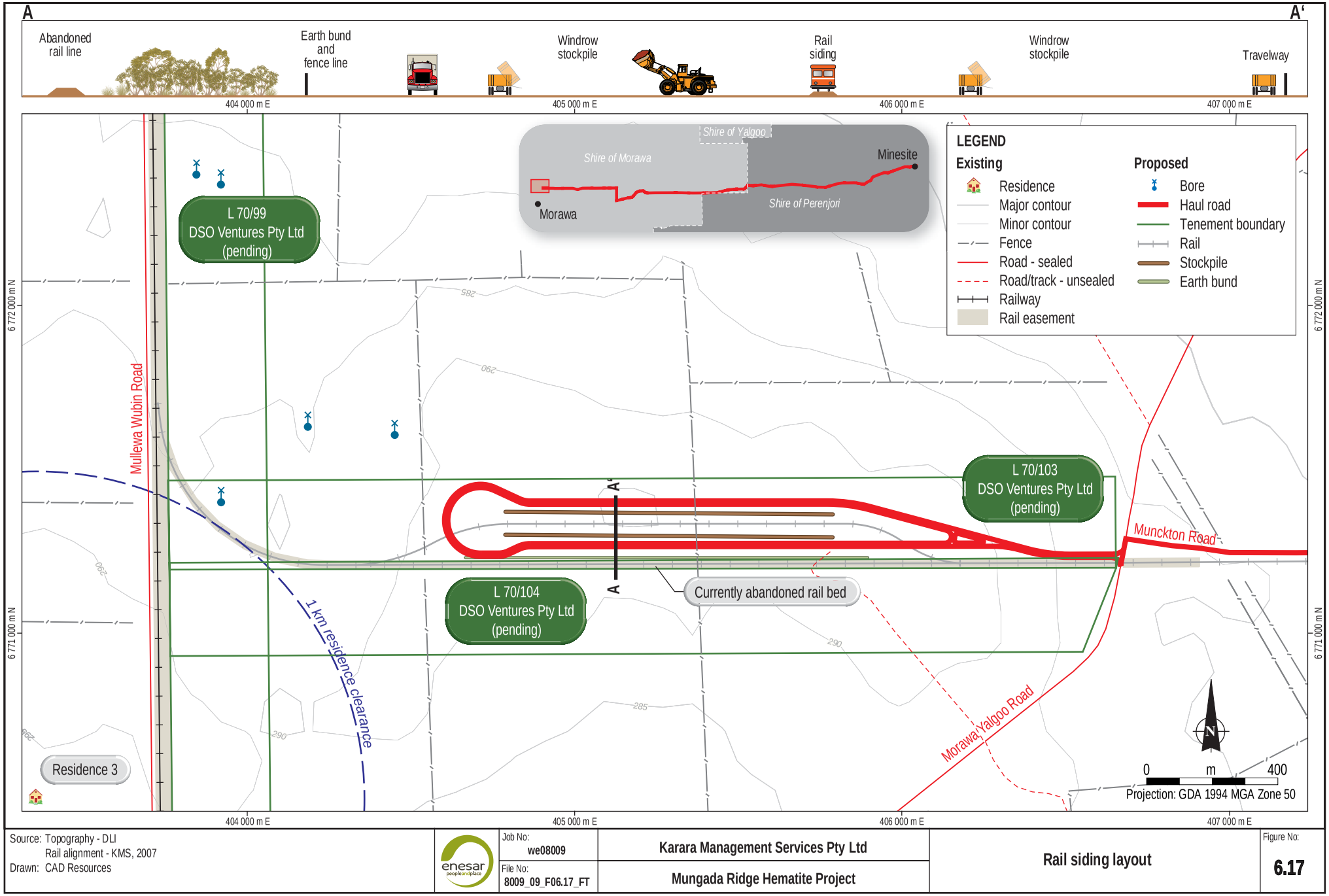
GCA undertook analysis of a sample of the material at the rail siding site to determine its acid-formation potential. Table 6.10 provides a summary of the analysis that was undertaken; the full analysis report is provided in Appendix 3. The analysis indicated that the material from the rail siding site is non-acid forming. (The operation and rehabilitation of borrow pits is discussed in Section 6.16.3.)

Table 6.10 Summary of the rail siding borrow pit sample analysis

Sample No.	Pit ID	pH	EC	Acid-forming Potential
GCA6541	Rail siding	4.9	4.4	Non-acid forming

Approximately, 0.13 GL of water will be required for the construction of the rail siding formation. Water for this purpose will be trucked from the Koolanooka borefield to the rail siding where it will be stored within the water storage tank. Midwest Corporation currently holds the tenure of the Koolanooka borefield. KMS is negotiating with Midwest for access to this water source.

Once the area has been cleared for the rail siding, a 200-mm to 300-mm covering of mineralised waste will be spread over the surface and compacted to provide a hardstand.



Source: Topography - DLI
Rail alignment - KMS, 2007
Drawn: CAD Resources

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Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Rail siding layout

Figure No: 6.17

6.11.2 Rail Siding Operation

Ore will be delivered and stockpiled by side-tipping road trains into one of two 700-m-long stockpiles, one for the lump product and the other for the fines product. The ore will be stockpiled to 2.5 m high, and each stockpile will have the capacity to store approximately 10,500 tonnes of ore, for a total storage capacity of 21,000 tonnes.

Approximately 0.18 GL of water per annum will be required for dust suppression at the rail siding. Water for dust suppression will also be sourced from the Koolanooka borefield until another groundwater source can be identified. Ongoing exploration drilling to define a suitable groundwater source is continuing. An assessment of the potential environmental impacts of abstraction will be conducted prior to seeking approval from the DoW.

Incident rainfall collected from sumps within the rail siding area will be pumped to the water storage tank for storage and use in dust suppression.

The power supply for the crib room, ablution facilities and workshop at the rail siding will be sourced from the South West Interconnected System (SWIS). Power lines will be constructed from the rail siding to the SWIS, located on the southern boundary of the rail line easement, approximately 50 m to the south of the rail siding site.

The workshop will be constructed with a concrete foundation, designed to ensure drainage is collected in an oil/water separation system. Hydrocarbons, including specific greases and oils required for mobile equipment maintenance, will be stored within a bunded facility that adjoins the workshop.

A designated refuelling area will be sited adjacent to a bulk hydrocarbon storage facility.

6.11.3 Ore Transport and Rail Network

Rail shipments from Morawa to the Port of Geraldton are expected to begin in 2008. Three trains per day, each with 60 rail wagons, will be required to meet export demand, and loading will be a 24-hour operation. An approved rail operator will be contracted to operate the trains.

Each rail wagon will have the capacity to carry 48 tonnes of ore, which equates to 2,880 tonnes per train. Approximately 8,640 tonnes of ore will be transported to the Port of Geraldton daily.

The line currently services four iron ore trains and two grain trains per day (Burnett, 2006). WestNet Rail manages the rail network and is responsible for maintaining the track infrastructure, supplying the train control function and determining track access fees.

6.12 Port Facilities

The Geraldton Port Authority manages the Port of Geraldton and all activities within the port. A memorandum of understanding is in place between KMS and the GPA. An agreement to enable KMS to use the Port of Geraldton facilities and to construct the infrastructure required to facilitate export of the iron ore product is currently being negotiated.

6.12.1 Port Infrastructure and Services

The infrastructure that is required at the port includes a product storage shed and an enclosed conveyor system to transport ore from the existing rail unloader to the storage shed and from the storage shed to the existing Berth 5 shiploader. A workshop and bulk fuel storage facility will also be required to service loading equipment and plant. The proposed port layout is shown in Figure 6.18.

Source: Aerial Mosaic - DLI

Job No: we08009	Karara Management Services Pty Ltd	Figure No: 6.18
File No: 8009_09_F06.18_HB	Mungada Ridge Hematite Project	Port facilities layout

The enclosed conveyor systems will be equipped with water sprays for dust suppression. It is anticipated that approximately 0.02 GL of water per annum will be required for dust suppression and domestic use. Geraldton town scheme water will be utilised for all water requirements at the port.

The power requirements for the operation of the conveyor system and the unloading and loading facilities at the port are expected to be approximately 3 MVA. This has been taken into account in the Geraldton Port Authority's expansion and will be supplied via the SWIS.

6.12.2 Train Unloading, Ore Storage and Ship Loading

The trains will be unloaded using the GPA's facilities, nominally Rail Unloader No. 1, which can currently receive ore at a rate of 1,800 tonnes per hour. The GPA is proposing to upgrade the existing rail unloader to handle approximately 2,700 tonnes per hour.

Enclosed conveyors will transport the ore from the rail unloader to the product storage shed. All conveyor transfer stations will be enclosed to minimise noise levels, reduce spillage and prevent fugitive dust. The 170-m by 75-m by 30-m-high storage shed will have the capacity to store 200,000 tonnes of ore.

Diesel front-end loaders or electric load-haul dump machines will be used to reclaim the ore from the stockpiles and feed it into the conveyor system for transfer to the existing Berth 5 ship loader.

On average, ship loading is expected to take 18 hours and to occur once a week. The ore will be exported in Panamax-size ships, which have the capacity to hold up to 65,000 tonnes of ore.

The design of the product storage shed is such that the handling and storage of the ore can occur with minimal dust emissions and without the use of large quantities of water to ensure dust emissions are controlled. An inspection program will be developed to ascertain if the dust management strategies incorporated into the design are achieving the aim of minimal dust emissions.

Trafficable areas surrounding the product storage shed will be sealed; any incident rainfall that reports to this area will be directed to a contained recovery system. The water will pass through a series of interceptor tanks prior to reporting to a holding tank. Water will be sourced from this holding tank for dust suppression within the shed. The holding tank will be designed to contain a 1-in-20-year rainfall event.

6.13 Non-process Waste Management

Non-process waste includes all waste generated by the project that is not mined waste rock. Non-process wastes include general office and village wastes (i.e., paper, cardboard, plastics, etc.), food scraps, tyres, inert waste (mainly non-recyclable construction waste), contaminated material meeting waste acceptance criteria, and special waste types 1 and 2 (asbestos, and certain types of biomedical waste). This section addresses the management of inert and putrescible wastes. The management of hazardous materials and hydrocarbon wastes is discussed in Section 6.14.

The management of non-process wastes is governed by the EP Act. At each of the project sites, a 'reduce, reuse and recycle' approach to waste management will be applied. KMS is committed to managing waste in an environmentally responsible manner during all phases of the project.

All putrescible and inert waste from the rail siding and Port of Geraldton will be disposed of at the local shire landfills at Morawa and Geraldton, respectively, or, at an approved recycling facility.

Due to the waste volumes that are likely to be generated annually, the minesite will require an on-site putrescible landfill. The details of recycling and landfill management are discussed in the following sections.

6.13.1 Recycling

As stated above, the project will apply a 'reduce, reuse and recycle' approach to waste management. The activities that will be undertaken to achieve this are discussed below.

Reduce

Where possible the amount of waste generated will be reduced by:

- Purchasing stock in bulk containers instead of numerous smaller containers.
- Where possible, purchasing and storing stock in refillable containers.
- Minimising the use of disposable containers on site.
- Developing electronic rather than paper-based office systems and procedures.

Reuse

To enable the reuse of equipment and materials on site, a lay-down yard will be established at the minesite. Materials will be segregated into material types to enable easy identification for later reuse. Only materials suitable for reuse that will not result in potential contamination of the surrounding environment will be stored at the lay-down yard.

Within the administration building, the reuse of materials such as paper and cardboards will be encouraged, where possible.

Recycle

KMS will establish a recycling program at the minesite. Materials suitable for recycling will be stored within a designated area on site and regularly transported from site to an approved recycling facility. Waste materials that may be suitable for recycling include:

- Paper and cardboard.
- Tyres.
- Scrap metals.
- Batteries.
- Plastics containers and bottles.
- Oils.
- Aluminium cans.

Review

Once implemented, KMS will review its recycling program, at the minesite, to examine opportunities to improve its efforts to minimise waste and maximise reuse and recycling.

6.13.2 Landfills

A landfill facility licensed to receive putrescible and inert wastes (Class II landfill) will be required at the minesite. Leachable wastes will be deposited into this purpose-built facility, which will be sited so that water inflow and outflow is minimised.

The remainder of the putrescible and inert waste generated on site will be deposited in landfill facilities located within the footprints of the waste rock dumps. The exact location of each landfill site will be determined by the mining schedule. These landfills will also be sited away from any watercourse and isolated from the groundwater table.

For the landfills in the waste rock dumps, a landfill trench will be excavated at natural ground level; the trench will regularly be covered and compacted with NAF fill material. Each landfill will be completely backfilled prior to the construction of the waste rock dump over the facility. A record of the GPS coordinates of all landfill sites will be maintained.

Integration of the landfill sites within the footprint of the waste rock dumps will minimise the total project area of disturbance and ensure that future ground disturbance will not result in disturbance of the landfills.

The landfills will be managed as per the Works Approval and Site Licence conditions. They will also be managed to ensure that they comply with licensing and environmental protection regulations, in addition to, ensuring that landfill life is maximised by identifying new opportunities to reduce, reuse and recycle waste. Periodic auditing of waste production will occur in order to achieve these objectives.

6.14 Hazardous Materials and Hydrocarbon Management

Temporary hydrocarbon storage facilities will be used during the construction phase of the project. Construction contracts will stipulate that contractors shall manage hazardous materials and hydrocarbons in a manner that is compliant with all legislation. Inspections of all temporary facilities will be conducted on a regular basis to monitor compliance.

The management of hazardous materials and hydrocarbons during the operations phase of the project is discussed below.

6.14.1 Explosives

The minesite is the only component of the project that will require the use and storage of explosives. ANFO and emulsion-based explosives, boosters and detonators will be stored on site. The proposed location of the explosives depot and magazine is shown in Figure 6.3. A total of 80 tonnes of explosive manufacturing compounds (50 tonnes of ammonium nitrate and 30 tonnes of emulsion), 2,000 boosters and 3,000 detonators will be required to ensure a consistent supply for blasting between deliveries, based on two weeks' supply.

Blasting requirements will change throughout the life of the project and will be dependent upon the mining schedule. A designated contractor will deliver the explosives and detonators to the minesite as required.

To avoid accidental contact, the explosives and detonators will be stored separately within a secured area limited to authorised personnel. The magazine and explosives depot will be built and operated in accordance with the appropriate dangerous goods regulations (see Figure 6.3).

Prior to the construction of these facilities, an application for a Magazine Licence and a Licence to Store Dangerous Goods will be submitted to DEC. The facilities will be constructed and managed in accordance with these licences and other relevant regulations.

6.14.2 Hydrocarbons

Minesite

Hydrocarbon storage facilities will be located in the vicinity of the workshop, in the contractors' yard and at the accommodation camp. Licensed providers will transport all hydrocarbon products to site. To ensure a consistent supply of diesel fuel, a minimum storage capacity of 8.5 days of fuel supply is required in each location. The estimated minimum storage requirements for each area are shown in Table 6.11. The annual diesel consumption at the minesite is anticipated to be approximately 20 ML.

Table 6.11 Fuel requirements and storage arrangements

Location	Requirement (kL)	Storage
Workshop	145	3 x 55-kL tanks
Contractors' yard	255	5 x 55-kL tanks
Accommodation Village	43	1 x 55-kL tank
Total Fuel Storage	**443**	**9 x 55-kL tanks**

In addition to diesel, approximately 15 kL of oil and grease will be stored on site for use during equipment maintenance. The estimated lubricant consumption is 160 kL per annum. These estimates assume that road haulage fleets will source half of their fuel and lubricant supply from the facilities at the rail siding.

Fuel and lubricants will be stored in appropriately lined and sized bunded areas. The bunds will be lined with a high-density polyethylene liner (or equivalent) with a permeability of less than 10^{-9} m/s. The hydrocarbon storage facilities will also include a range of 200-L lubricant drums and 1,000-L lubricant tanks. Designated refuelling areas will be established in order to contain potential hydrocarbon spillages.

The outlying diesel generators at the water bores and communication facilities will each have a self-bunded fuel tank that will be filled on a daily basis via a fuel service truck from the minesite. It is expected that each of these fuel tanks will have a capacity of less than 3,000 L.

Water potentially contaminated by hydrocarbons will be collected by the workshop drainage systems and by the sumps within the bunds and hardstand areas for processing through an oil/water separation system. The processed water from the oil/water separator will be disposed of within an appropriately designed and managed bioremediation area. This system will be monitored regularly to ensure the oil/water separation system is working effectively.

Waste hydrocarbons (including those collected from the oil/water separator and from vehicle servicing) will be stored within a waste hydrocarbon tank within a bunded facility. Waste hydrocarbons will be collected and removed from the minesite by an approved licensed contractor for recycling. Alternatively, the oil may be centrifuged on site and reinjected into the diesel generators if centrifuged hydrocarbons are suitable for this purpose.

Rail Siding

A single 55-kL diesel fuel storage tank will be used for refuelling road trains and loading equipment. The annual diesel consumption at the rail siding is expected to be approximately 400 kL for loading equipment and 3,400 kL for road trains. The fuel tank will be within a suitably bunded and lined hydrocarbon storage facility.

Approximately 3,000 L of oil and grease will be stored within the workshop for the maintenance and servicing of loaders and trucks. The oils and grease will be stored in portable bunds or within the bunded hydrocarbon storage area.

These estimates assume that the road haulage fleet will source half of its fuel and lubricant supply at the rail siding and the other half at the minesite. Hence, the proposed fuel storage facility will only require refilling approximately every ten days. This storage volume is deemed acceptable due to the proximity of the rail siding to the Morawa townsite.

Hydrocarbon storage at the minesite and rail siding will be subject to stringent inventory control to identify and manage any spills or other losses. Appropriate management systems will also be in place to reduce the impact of any spill.

Port

A workshop and bulk diesel storage area will be established within the project's facilities at the Port of Geraldton for the maintenance and servicing of the diesel front-end loaders or electric load haul dump machines. Hydrocarbon storage and use areas will be designed to ensure containment and recovery of any spillages.

6.14.3 Other Hazardous Materials

In addition to explosives and hydrocarbons, other hazardous materials that may be required for use at the minesite, rail siding or port include:

- Paints.
- Degreasers.
- Cleaning agents.
- Batteries.
- Coolants.
- Laboratory chemicals.

Only small quantities of these substances will be stored in any one location. All substances will be permitted, stored and used in accordance with the government regulations and in accordance with individual materials safety data sheets.

6.15 Safety and Security Management

If appropriate measures are not implemented at each of the project components during both construction and operation, there is the potential of risk to the safety and security of staff, contractors and the public. KMS is committed to conducting all operations in a responsible manner that minimises potential risks.

KMS states (Gindalbie, 2006) that as standard practice, the company:

- Does not compromise on safety.
- Complies with legislative requirements.
- Identifies, assesses and manages environmental health and safety hazards, risks and impacts of operations.

- Maintains an occupational health and safety management system to apply best industry standards to all operations, activities, and personnel.
- Promotes continuous improvement practices within all aspects of business.
- Minimises workplace exposure to hazards.
- Understands and works to meet the expectations of the community.
- Provides appropriate training to employees and contractors to ensure environmental, health and safety responsibilities are understood.

To achieve this commitment, a risk assessment of all project operations will be undertaken prior to commencing activity. For the risks identified, the following hierarchy of control will be used to eliminate or reduce the risk to an acceptable level:

- Elimination – if there is the option to eliminate the risk completely, this will be chosen. Eliminating a risk may include not carrying out an activity or replacing equipment with a safer alternative.
- Engineering solution – if the risk cannot be eliminated, then, where viable, engineering controls will be installed, such as handrails for stair cases and protective guards where there is the potential for pinch points.
- Procedural management – if engineering controls are not viable or are inadequate to reduce the potential risk to an acceptable level, then procedures will be implemented that outline the requirements for undertaking the activity safely.
- Personal protective equipment (PPE) – task-specific PPE requirements will be determined based on the potential risks associated with the activity.

At each of the project components, the implementation of a safety management system, the need for induction and training, the requirements for PPE and the management of workers' fitness for work will be aligned. These issues are discussed below.

6.15.1 Safety Management System

KMS will develop a safety management system based on the Australia Standard for occupational health and safety, AS/NZS 4801:2001 (Joint Technical Committee SF 001, 2001). The components of this system will detail the management measures that will be implemented to reduce the potential risk to the safety and security of staff, contractors and the general public.

The Project Management Plan, as required by DoCEP prior to operations commencing, will be developed in alignment with the safety management system.

6.15.2 Induction and Training

An area-specific induction package will be developed for each of the project components detailing the safety and environmental requirements. All personnel will be required to complete the induction prior to working within the project.

When necessary, specific safety and environmental training courses will be provided, both internal and external, for employees who are undertaking an activity that has the potential to result in significant harm to themselves, other employees, the general public or the environment.

6.15.3 Personal Protective Equipment

At each of the project components, the minimum PPE requirement will be determined on the basis of the potential risks at that component and will be communicated to all personnel during induction. Additional activity-specific PPE will be determined when there is the potential for harm as a result of an activity. For example, wearing welding masks while welding, hearing protection when exposed to loud noise and dust masks while working in dusty conditions.

The requirement for activity-specific PPE will be communicated to all personnel who are required to undertake the activity. Signage that indicates the PPE requirements will also be installed, where required.

6.15.4 Fitness for Work

KMS is committed to ensuring that all personnel are fit to undertake the tasks required of them within the project. Potential adverse impacts on fitness for work include:

- Drugs.
- Alcohol.
- Fatigue.
- Heat stress.
- Emotional distress.
- Physical injury.
- Illness.

Appropriate policies, standards and procedures will be developed as part of the safety management system to manage the potential impacts to staff and contractors' fitness for work.

6.15.5 Emergency Response

An emergency response team will be developed; sufficient personnel will undertake training to ensure both shifts have adequate emergency response coverage, and a minimum of one person per shift will undertake Mines Rescue Paramedic training. Personnel within the emergency response team will undertake regular training to ensure a high level of skill is maintained. Equipment appropriate to the types of emergency response anticipated for the project will be purchased, including a dedicated fire-fighting unit.

A first aid room and emergency response training room will be established. One telephone line will remain dedicated to emergency response purposes for the duration of the project life.

A site-specific emergency response manual will be developed prior to project commencement and revised annually. The manual and the project's emergency response systems will be developed in consultation with DoCEP and relevant emergency service providers.

6.16 Vegetation and Soil Management

The stripped vegetation and topsoil will be used for progressive rehabilitation where possible or stockpiled for later use. The proposed management of cleared vegetation and topsoil is discussed below.

KMS will manage vegetation clearing and soil stripping and stockpiling in accordance with the measures discussed below.

6.16.1 Vegetation Clearing

KMS will minimise the extent of vegetation clearing and incidental disturbance via:

- Induction of employees and contractors.
- Authorisation of areas to be cleared through the use of on-site clearing permits.
- Clear demarcation of areas to be cleared and those to be protected from clearance.
- Restriction of vehicle movement to roads and hardstand areas.

KMS will maximise the opportunities for collection of native plant propagules (seeds, cuttings, lignotubers or rhizomes as appropriate) prior to vegetation clearing in consultation with DEC.

Vegetation clearing will be carried out using an appropriately sized dozer. The dozer blade will be raised to minimise disturbance to the topsoil and potential mixing of topsoil and vegetation.

The stripped vegetation will be stored in windrows and, where practicable, will be used to assist with erosion control on topsoil stockpiles and progressive rehabilitation of disturbed areas.

6.16.2 Soil Stripping and Stockpiling

A soil quality assessment conducted by Landloch Pty Ltd (Appendix 1) indicates that the soils within the minesite area are broadly distributed as three soil groups:

- Soils from crests and ridge tops: shallow soils with large components of ironstone gravel and rock.
- Soils from sloping areas: permeable soils of reasonable depth and chemistry.

- Soils from low-lying areas: poorly drained soils that tend to be more saline, dispersive, and prone to erosion but that will also have greater potential productivity due to higher plant-available water capacity and possibly fertility.

Each of these soil groups has a distinct use or application for rehabilitation purposes, and therefore each group will be stockpiled and managed separately. Further discussion of the findings of the soil quality assessment and measures for maintaining soil quality are provided in Section 7.1.

The topsoil component of the soil profile generally comprises only the top 100 mm of soil, which is rich in seed, nutrients and microbes. Topsoil will be stripped from disturbance areas within the project and stockpiled to a maximum height of 1.5 m. If practicable, the topsoil will be used for progressive rehabilitation. Where immediate use of topsoil is not practicable, efforts will be made to minimise the time that topsoil remains in stockpiles.

Subsoil material, up to 1 m below ground level, will be stripped and stockpiled from areas to be developed. Subsoil will be held in stockpiles up to 3 m high and will be used for the rehabilitation of the waste rock dumps.

Soil will not be stripped until required by the construction or mining schedules. Stripping will not be conducted in high wind conditions to avoid unnecessary loss of the soil and impacts to workers and the surrounding environment.

Designated areas for vegetation, topsoil and subsoil stockpiles will be located, as far as is practicable, within the footprints of the waste rock dumps that are shown in Figure 6.3. The placement of these stockpiles will also consider surface water and wind erosion effects and will be located to minimize these effects.

Borrow Pits

Six borrow pit locations have been identified: five for use during the construction of the haul road and the sixth for the rail siding. The borrow material at these locations is believed to be up to 1.5 m in depth.

Following the completion of the haul road and rail siding construction, the borrow pits will be closed and rehabilitated. Weed infestation will be managed prior to and during rehabilitation of the borrow pits.

The rehabilitation works required for the borrow pits include:

- Battering down of the pit walls to a gentle slope that is unlikely to erode. The wall angle will be determined by the erosive properties of the soils surrounding the borrow pit.
- Recontouring of the pit floor to avoid large ponds developing within the pit that may result in erosion channels.
- Respreading of the topsoil that was stripped from the borrow pit area prior to development.
- Light ripping of the disturbed area to break up potentially compacted subsoils to enable plant roots to penetrate.
- Potential seeding of the area. The requirement for this will be determined following closure of the pit and will be dependent upon what the existing vegetation communities were and likelihood of natural self-seeding.

6.17 Mine Closure

6.17.1 Introduction

The process of mine closure starts well before the completion of mining with progressive rehabilitation and may continue well beyond the completion of mining as ecosystems return to a state where they meet completion criteria for the project and are considered to be self-sustaining. Mine closure planning is a continuous process and mine closure, including rehabilitation, will be further refined through detailed, design, stakeholder consultation, completion criteria and various studies.

A draft conceptual mine closure plan has been provided as supplementary information to this PER. Some elements of the draft conceptual mine closure plan are discussed here.

6.17.2 Haul Road, Rail Siding and Port Facilities

It is anticipated that the existing road from Morawa to the minesite (i.e., the haul road) will remain as a public road after mine closure, and the responsibility for maintenance will revert to the local council. No special requirements for closure of the road are envisioned.

At the time of mine closure, a decision will be made in conjunction with relevant stakeholders as to whether the rail siding facilities near Morawa should be decommissioned and rehabilitated or, left in place as an infrastructure asset. A similar decision and approach will apply to the port facilities.

The remainder of Section 6.17 discusses rehabilitation and closure of the minesite.

6.17.3 Standards

This conceptual plan considers the relevant aspects of the following guidelines:

- Rehabilitation of Terrestrial Ecosystems, EPA Guidance Statement No. 6 (EPA, 2006b): Provides guidance on the use of rehabilitation objectives and completion criteria for the rehabilitation of natural ecosystems and restoration of biodiversity and acknowledges the importance of scientific research and monitored trials.
- Guidelines for Mining Proposal in Western Australia (DoIR, 2006a): Sets out the expectations of the DoIR in regard to rehabilitation and mine closure planning.
- Mine Void Water Resource Issues in Western Australia (Johnson & Wright, 2003): Describes potential impacts associated with mine void water as salinity and acidification of ground water, includes objectives for closure planning for mine voids and presents several case studies from Western Australia and Queensland.
- Guidelines for Mining in Arid Environments (DME, 1996): Describes arid-zone environments and presents a practical approach to operation management, land rehabilitation and monitoring.
- Strategic Framework for Mine Closure (ANZMEC & MCA, 2000): Provides a framework for mine closure in Australia and outlines strategies for stakeholder involvement, planning, financial provisions and closure implementation.
- Mine Rehabilitation (Commonwealth of Australia, 2006a): Provides a framework for leading practice mine rehabilitation planning, covers sustainable development and mine rehabilitation, planning, operations and closure and is highlighted with a number of case studies.
- Mine Closure and Completion (Commonwealth of Australia, 2006b): Describes leading practice in a whole-of-mine approach to consideration of mine closure, covering exploration, planning and design, operations and decommissioning, and uses case studies to highlight leading practice.

6.17.4 Post-mining Land Use

Planning and implementation of mine closure for any given site requires the establishment of an appropriate set of mine closure objectives. A first step in establishing these objectives is to identify potential post-mining land uses.

The minesite is situated on unallocated Crown land, formerly the Karara Pastoral Lease, which is managed by DEC for conservation purposes under Section 33(2) of the *Conservation and Land Management Act 1984*. From consultation to date, KMS understands that DEC would like to create a conservation park over all or, portions of, the former Karara Pastoral Lease for the purpose of protecting flora and biodiversity values. Specifically, DEC wishes to protect the habitats associated with the BIF ridges.

Other stakeholders, such as the Wildflower Society of Western Australia and the Conservation Council of Western Australia have also indicated that they would like to see the conservation of environmental values in the area.

While the area around the minesite is currently visited infrequently by recreational users (Spalding, pers. com., 2006), the scenic nature of the region and relatively good condition of the vegetation suggests that the area could one day be used more frequently for recreation. However, it should be noted that the proposed Karara Magnetite Project, located approximately 12 km to the west of the Mungada Ridge Hematite Project, is anticipated to have a significantly longer operational mine life (40 years) than the Hematite project, which might deter recreational use in the area post mine closure.

Given the economically prospective geology of the minesite area, it is quite possible that future generations may undertake further mineral exploration and mining in the area.

As discussed in Section 7.12, there are no listed heritage sites within the immediate minesite area of the project. However, care will be taken to identify and manage any potential sites in a sensitive manner. Thus, for the time being, protection or enhancement of heritage sites is not seen as a future land use.

In summary, it is currently understood by KMS that the preferred post-mining land use of the minesite area, particularly the BIF ridges that have not been disturbed by mining, is a conservation park for the purpose of protecting flora and biodiversity values. There is also some potential for recreational use or further mining activities.

Confirmation of these land uses is subject to further and ongoing discussion with stakeholders during detailed design, operations and closure planning.

6.17.5 Objectives

In the context of the above, KMS has identified seven objectives for achieving acceptable outcomes for rehabilitation and closure of the minesite. The objectives are divided into two sets: progressive and other.

These objectives follow and are also presented in Figure 6.19.

Progressive Objectives

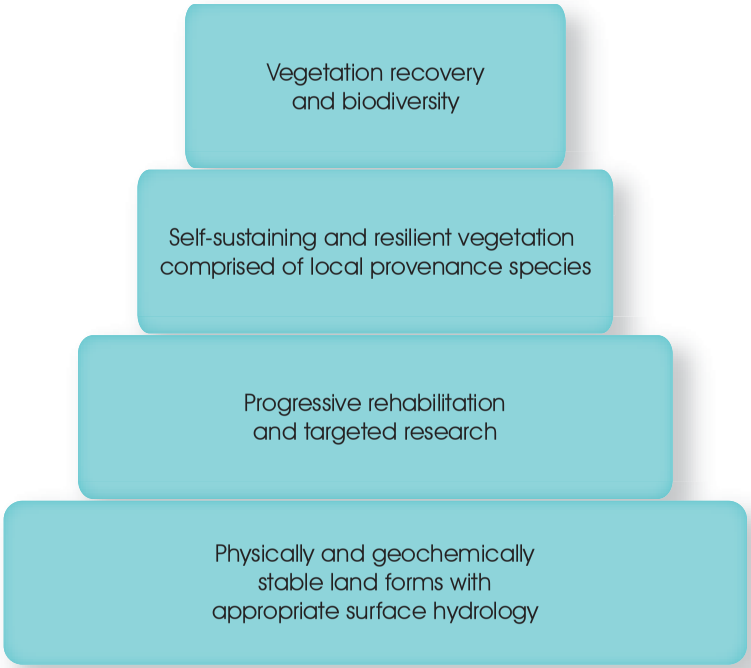
- Design and construct physically and geochemically stable landforms, with appropriate surface hydrology, that are resistant to erosion and soil loss.
- Conduct progressive rehabilitation and targeted research throughout the mine's operating life to develop site-specific methodologies and to assist in identifying achievable completion criteria.
- Establish self-sustaining and resilient vegetation comprised of local provenance species.
- Reach agreed numeric targets for vegetation recovery and biodiversity.

These progressive objectives are presented in approximate order of priority, as well as approximate order of difficulty. Moreover, attainment of the basal objectives will provide the foundation for achieving more difficult objectives in the series. For example, creating stable landforms will be a critical step towards achieving self-sustaining and resilient vegetation.

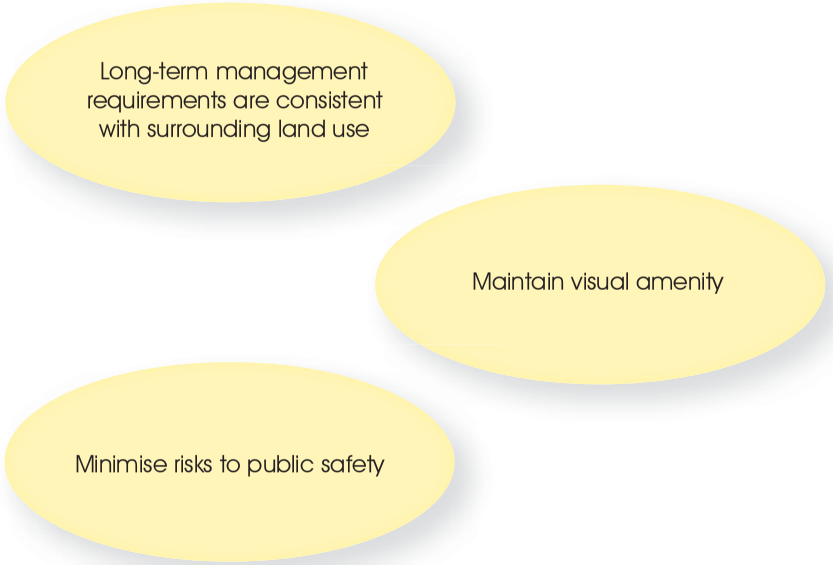
In addition to the above progressive objectives, KMS has identified three other objectives for successful rehabilitation and closure of the minesite.

Other Objectives

- Leave the site in a safe condition, including securing of the pit voids, so as to minimise risks to public safety.
- Maintain visual amenity of the site by creating landforms and vegetation covers that blend into the natural surroundings.
- Achieve a rehabilitated state where long-term management requirements are consistent with surrounding land use (i.e., a conservation park).



Progressional Objectives



Other Objectives

enesar peopleandplace	Job No: we08009	Karara Management Services Pty Ltd	**Objectives for rehabilitation and mine closure**	Figure No: **6.19**
	File No: 8009_09_F06.19_FT	Mungada Ridge Hematite Project		

6.17.6 Responsibilities

Management of rehabilitation and closure planning activities through the detailed design and operations phases of the project will be the responsibility of the General Manager, Operations, who will be assisted in this function by the General Manager, Mining. During the post-closure period, mine decommissioning, rehabilitation and monitoring will be the responsibility of the board of KMS.

6.17.7 Financial Provisions

Financial provisions will be made during the life of the operation to ensure that sufficient funds are set aside to adequately cover the costs of final decommissioning and closure. KMS will conduct an annual review of the closure liabilities associated with its mining activities in accordance with generally accepted accounting practices.

6.17.8 Completion Criteria and Rehabilitation Strategy

Background

Completion criteria relate directly to the expected final outcome of the project with respect to post-mining land uses, landforms and biological characteristics of the project area. These criteria will become long-term targets to focus the operational and rehabilitation processes during the life of the project and also provide context for long-term planning of landforms and rehabilitation development activities.

Purpose of the Strategy

The rehabilitation strategy is designed to initiate discussion regarding the development of long-term rehabilitation procedures and completion criteria for the project. Towards this objective, the strategy also identifies the key processes that will be developed both to support the development of the completion criteria and to allow the project to begin achieving them via a process of continuous improvement in planning, monitoring and acting on improvement opportunities.

It is intended that responsible decision-making authorities will be included in the process via presentation and discussion of the completion criteria and rehabilitation strategy, through planning processes, and through periodic reporting of progress (e.g., the Annual Environmental Report). Documentation of the completion criteria model, supporting processes for rehabilitation planning, and setting of interim performance targets will be critical to support the selection of final completion criteria and indicators of success.

Completion Criteria

It is envisaged that completion criteria will be set for the following aspects of the project:

- Safety of the project area (risk to the public and liability to stakeholders).
- Final landform and stability.
- Conservation of significant species and vegetation.
- Weed status of native vegetation areas.
- Sustainability and resilience of rehabilitation vegetation to disease, drought and fire.
- Suitability of rehabilitation vegetation and other factors to provide habitat for fauna and significant flora species.

Completion criteria will be developed and refined over time as research and trial results are analysed and tested. Performance indicators will also be developed so that monitoring can effectively demonstrate when completion criteria have been achieved. These performance indicators will be developed and agreed with government regulators.

Performance Targets

Within a system of defined and achievable completion criteria, a dynamic set of performance targets will act as short-term planning tools for such activities as:

- Scheduling of milestone tasks: design planning, research, rehabilitation and monitoring.
- Designing functional landforms and rehabilitation soil profiles.
- Planning site drainage and hydrological systems.
- Defining target floristic community types for rehabilitation.
- Establishing biological diversity targets.
- Establishing soil and flora targets to address fauna requirements in rehabilitation.
- Determining key performance indicators that demonstrate progress toward long-term completion criteria.
- Establishing a representative flora and fauna monitoring program.

Performance targets will be developed for specific aspects of rehabilitation. For example:

- Slope angles and soil profiles of constructed landforms.
- Direct return of topsoil or reuse within specified timeframes.
- Weed species within rehabilitation areas.
- Species richness and plant density within rehabilitation areas.
- Presence and frequency of keystone species for specific floristic community types within rehabilitation areas.

The performance targets will be set through a process of researching and documenting the natural ecosystems of the mining area, adjacent vegetation or other appropriate ecosystems. Monitoring against these targets, and also through the design and monitoring of trials, can identify processes where improvement is required or formal research may be necessary.

Rehabilitation Procedure Development Strategy

A rehabilitation procedure will be developed as part of the rehabilitation and mine closure plan based on a number of key components. Each component will include specific procedures and performance targets to be achieved in each discipline. In general, the rehabilitation procedure will include, as a minimum, landform design, soil profile reconstruction, isolation of reactive waste rock, management and utilisation of topsoil and vegetation debris, ripping to create friable seedbed and a root penetration zone, and the application of provenance-correct seed.
Table 6.12 outlines the approach that KMS will utilise to develop the rehabilitation procedure and its components.

Table 6.12 Rehabilitation procedure development strategy		
Process Task	**Task Outcome**	**Component**
1. Review existing vegetation mapping data and existing soil profile and geological data of the project area.	Determine the relationship between vegetation type (habitat) and underlying soils and hydrology.	Rehabilitation research and monitoring.
2. Review geological data and mine-planning process.	Determine the final landforms that may be produced following mining commensurate with commitments, mining schedule and costs.	Landform design and waste rock management.
3. Review pre-existing hydrogeology, soil profiles and overburden properties.	Determine soil and overburden combinations that best represent pre-existing soil profiles for particular locations in the landscape.	Soil profile reconstruction and monitoring.
4. Review existing floristic community types and identify groupings of types based on key functional environmental factors such as position in the landscape, soil type and hydrological requirements.	List of target floristic community types to be established.	Rehabilitation research and monitoring. Rehabilitation program.
5. To use data collected from Task outcomes 1 thru 3 to identify an appropriate natural system to use as a model for proposed rehabilitation works.	Final landform design, soil profile reconstruction and operational rehabilitation program will mimic the pre-mined natural system.	Rehabilitation research and monitoring. Rehabilitation program.
6. Investigate list of target floristic community types to identify keystone species for each type.	Keystone species will be identified for each floristic community type. Recalcitrant species (significant species that do not establish readily in rehabilitation) will also be identified.	Rehabilitation research and monitoring. Rehabilitation program.
7. Investigate keystone species to determine life history and appropriate establishment strategy in rehabilitation (e.g., topsoil, mulch, seed, tubestock, etc.).	Establishment strategies for keystone species and any recalcitrant species.	Rehabilitation program (incorporating a recalcitrant species program and refinement of completion criteria and performance targets).
8. Develop and continually review rehabilitation soil movement plans to optimise use of direct return topsoil to establish identified floristic community types.	Operational topsoil and overburden management plans.	Soil reconstruction and monitoring.
9. Develop and continually review rehabilitation vegetation resource (mulch) movement plans to optimise use of cleared vegetation to establish identified floristic community types.	Operational vegetation management plans.	Vegetation management. Rehabilitation program.
10. Develop a monitoring program to demonstrate performance of rehabilitation against short-term performance targets and long-term completion criteria.	Rehabilitation monitoring program.	Rehabilitation research and monitoring.
11. Annually review rehabilitation performance and completion criteria and design research or operational trials to improve performance.	Research and development program.	Rehabilitation research and monitoring.

Process tasks one to four have already been completed or nearly completed as part of the impact assessment studies undertaken to date for the project. Significant volumes of work on the vegetation and flora (see Appendices 6, 7 and 8) and fauna habitats (see Appendices 9 to 14 within the project area have been completed, soils have been characterised by Landloch (Appendix 1), and GCA (Appendix 2) has assessed the geochemical characteristics of mined materials.

Benchmarking and Leading Practice

Benchmarking involves reviewing processes in use within an industry to identify leading practice to achieve desired outcomes. (It is also used to measure one's own performance against industry peers; however, this aspect is not utilised widely in mining rehabilitation as each site often has unique conditions and challenges that make this aspect of benchmarking less applicable.)

The approach outlined in Table 6.12 will be supported at critical points by benchmarking to identify current leading-practice techniques for rehabilitation methods. This will ensure that KMS implements leading practice for their rehabilitation operations and will optimise chances for successful achievement of completion criteria.

6.17.9 Landform Design

Pit Voids

The potential issues associated with pit voids reported in Mine Void Water Resource Issues (Johnson & Wright, 2003) are:

- Increased salinisation through evaporation of groundwater-fed open pit waters leading to hypersaline conditions.
- Acidification of waters through oxidation of sulfides and leaching from exposed PAF rock on open pit walls.

These two processes can have an influence on the quality of surrounding groundwater systems.

The first of these two potential impacts, salinisation, is not considered relevant to the project as the proposed pits will all be above the groundwater table. Consequently, the pits will not form groundwater sinks.

The pits will, however, collect incident precipitation and some surface runoff, which may enhance groundwater recharge conditions slightly. Given the low average annual rainfall of the area (272 mm per annum) and the high evaporation rate, it is expected that any water ponding within the pits will be of short duration and/or seasonal only. However, to minimise the potential of water ponding in the pits, should the geology of the final pit depth be found not to be conducive to water infiltration, then the final pit bottom will be blasted to provide a friable layer to absorb incident rainfall.

The predicted absence of permanent waterbodies in the pits suggests that further study of acidification of pit water is not warranted.

Backfilling of the open pits has been considered but has been largely discounted for several reasons. The major concern is the negative impact on project viability; backfilling is not economically viable. Backfilling would also reduce the capacity to exploit potential magnetite ore thought to occur at depth below the known hematite deposits. Ecologically, it is the opinion of KMS that, in the future, beyond this project's life, meeting demand for iron ore from brownfield development of existing pits such as these would result in a lesser environmental footprint than development of new greenfield pits elsewhere.

Further, the absence of a beneficial use of ground water and the slight potential for groundwater recharge means that this issue is not influential in arguments for backfilling.

KMS acknowledges that backfilling would reduce the project impact on flora and fauna values and may lessen the impact on visual amenity, although, with respect to the latter, the final waste rock dumps are expected to largely obscure the exposed open pits when viewed from the west. Further details are provided in Section 7.6.4. KMS will continue to review its position on backfilling based on further drilling, mine modelling and the potential environmental benefits (such as Declared Rare Fauna and significant floral species).

Waste Rock Dumps

Landform design for the waste rock dumps is discussed in Section 6.7.1. The final landform geometry and soil profile reconstruction will be developed over time in accordance with the rehabilitation procedure development strategy outlined in Table 6.12 to best achieve the project's rehabilitation and mine closure objectives.

Mineralised Waste Stockpiles

As discussed in Section 6.7.3, mineralised waste will be stored within the footprint of the ROM pad or waste rock dumps for possible future processing. If the mineralised waste is processed, the areas will be contoured, ripped, topsoiled and revegetated as they become available. In the event that the mineralised waste stockpiles are not processed, then they will be rehabilitated in a similar manner to the waste rock dumps.

Minesite Infrastructure Areas

All infrastructure will be removed to a maximum of 1 m below ground level. These areas will then be ripped to elevated compaction, shaped to blend in with existing landforms, covered with topsoil and seeded.

6.17.10 Implementation Strategies and Measures

Consultation

- Identify and engage relevant stakeholders in a consultation program whereby their concerns and interests can be addressed during mine closure planning. Stakeholders are listed in Section 4.2.
- Allocate adequate resources to the consultation process to enable effective and open communication (stakeholders will require the necessary information and resources to participate in the consultation process).
- Initiate the mine closure consultation process during the planning phase, with a key focus being the proposed post-mining land uses for the area (as currently described above in Section 6.17.4).

Planning

- Assign sufficient personnel, physical and monetary resources for closure planning, implementation and monitoring. Personnel should have clearly delineated roles and responsibilities.
- Determine legal and other obligations relating to mine closure.
- Identify and assess risks associated with closure.
- Determine closure completion criteria in consultation with relevant stakeholders.
- Following approval of the project, prepare and periodically review (taking into account progressive rehabilitation and changing community standards and expectations) a detailed rehabilitation and mine closure plan.
- Develop a cost estimate for closure from the detailed rehabilitation and mine closure plan.
- Review the mine closure cost estimate regularly, e.g., annually, to reflect changing circumstances.
- Ensure that, at the end of mine life when income has ceased, there is sufficient accounting provision accrued to cover both mine closure and ongoing (post-closure) expenditure.

Contamination Assessment and Remediation

- Prepare a separate environmental management plan (as part of the detailed environmental management system (EMS) (see Section 8) for the assessment, remediation and removal of potential contamination by hydrocarbons or other contaminants in accordance with the Contaminated Sites Act 2003.

Land Stabilisation

Key aspects of land stabilisation include the following:

- Minimising Disturbance: A key element to successful land stabilisation is minimising the area of land disturbed. KMS is committed to the principle of clearing land only when required.
- Vegetation Clearance and Soil Management: When clearing, vegetation will be collected for use in the rehabilitation program. Soils from all areas to be developed will be stripped and used for rehabilitation. Details of vegetation and soil management are described in Sections 6.16 and 7.1.
- Erosion Control: The two natural elements that disturbed areas need to be protected from are wind and water. Prior to establishment of vegetation cover, the soil surface will be protected with rock or mulch. Runoff management will include diverting clean runoff away from disturbed areas, directing turbid runoff (dirty water) to sediment traps and reducing the velocity of runoff on disturbed areas by appropriate landforming.
- Landforming: This involves shaping slopes, and ripping and scarifying the soil so as to reduce runoff velocity, promote infiltration and minimise erosion. Ripping and scarifying also provide protection for germinating seeds and assists root penetration. The final landforms created will be compatible with the surrounding landscape.

Surface Water Management

Surface drainage features, including sediment traps, established during operations will be retained post-closure. The reasons for this are:

- Surface drainage features established during operations will be complete and stable.
- Clean water will remain separated from turbid water draining areas of disturbance.
- Although vegetation will be established, sediment traps will continue to provide a final filter for runoff from the rehabilitated site.
- These features may have been colonised by fauna, thereby creating new habitat areas.
- Re-contouring to return runoff to pre-existing drainage paths could damage vegetation established during progressive rehabilitation activities.

Progress Rehabilitation Activities

Rehabilitation will be undertaken progressively where possible. However, due to the nature of the operations, much of the rehabilitation will only be possible after mining ceases. This will include removal of site infrastructure, stabilisation of land, and ripping and revegetating of disturbed areas as described below. General rehabilitation activities include the following:

- Prior to any vegetation clearance, trained personnel will be used to collect native plant propagules for later use in rehabilitation.
- Collection of native plant propagules and growth of tubestock will continue on an annual basis for the life of the project.
- Revegetation of disturbed areas will occur progressively throughout the operation, where practicable.
- Deep ripping, particularly of roads and hardstand areas, will be used to alleviate compaction.

- Topsoil and subsoil stockpiled during the mining process will be replaced as the final landforms are achieved. Ideally, the topsoil stockpiles will retain their seed resources, allowing revegetation to occur naturally. If this does not occur to a sufficient degree, the area will be seeded and possibly fertilised, with the application of seed and fertilisers being timed to take best advantage of moisture and seasonal conditions.
- To reduce susceptibility to erosion, completed sections will not remain devoid of vegetative cover for any length of time.
- In general, site revegetation will occur in two stages, i.e., primary revegetation and secondary revegetation. The aim of the primary revegetation stage is to establish good vegetative cover on the disturbed area as soon as possible (thereby reducing potential for erosion). The secondary stage of revegetation aims to establish a more long-term cover of low-maintenance vegetation that will eventually be self-sustaining. The two revegetation stages require different plant species:
  - Primary revegetation: includes selection of a suitable mixture of grass species to adequately control erosion until indigenous tree and shrub species become fully established. Primary vegetation will normally be invaded by indigenous species from adjacent undisturbed areas.
  - Secondary revegetation: includes the establishment of indigenous tree and shrub species.
- Where practicable, native grass species will be used. Specialist advice on vegetation species and fertiliser requirements will be sought.

Activities involved in vegetation maintenance will include:

- The development of a vegetation maintenance program to ensure revegetated areas remain effective.
- Correct maintenance of all areas of vegetation cover to ensure a persistent and uniform protective sward. Topdressing of revegetated areas with fertiliser and supplementary seed will be undertaken after the first growing season if required.
- Weed, feral animal and pathogen control will also be undertaken as necessary.

6.17.11 Post-closure Monitoring and Maintenance

Rehabilitation Works

Methods to monitor and maintain rehabilitated and revegetated areas will include:

- Ensuring that the monitoring program reflects the agreed closure criteria and performance indicators.
- Establishing 360° photo-monitoring points within the minesite area.
- Conducting post-rehabilitation follow-up visits to the project area on a regular and frequent basis (frequency decreasing with time) to monitor the success rate of seedling emergence and survival, weed invasion, browsing levels (i.e., insect and animal attack of regenerating vegetation) and erosion, using the photo-monitoring points to track progress.
- Establishing water quality monitoring locations to monitor the success of rehabilitation works.
- Where monitoring has identified erosion, weed invasion, failure of revegetation (to any material degree) or excessive browser damage to regenerating vegetation, maintenance activities will be implemented to ensure regeneration progresses successfully and rapidly. These may include:
  - Repairing eroded areas.
  - Weed control.
  - Insect and feral animal control.
  - Enrichment planting.
  - Spot sowing.
  - Reseeding.
  - Watering.
  - Fertilising.

Water Quality

Ongoing sampling and monitoring of groundwater bores (water level and quality), selected surface water sampling locations and final void water (if present) will continue for an appropriate period of time following the cessation of active operations.

6.17.12 Final Decommissioning and Relinquishment

As part of the closure planning process, a Rehabilitation and Closure EMP will be developed in consultation with government regulators. This plan will detail completion criteria and establish the timeline for decommissioning and determination of compliance with their requirements for relinquishment.

6.18 Project Alternatives Considered

Resource development projects are subject to a number of constraints:

- Physically, by the location of the orebody, regional climate, topography and geotechnical constraints imposed by the project setting.
- Economically, by the need to extract and process the ore profitably.
- Environmentally, by the sensitivities of the local environmental setting.
- Socially, by the expectations and concerns of affected communities and other stakeholders.

A fundamental constraint of all mineral resource developments is that they can only occur where a commercially viable resource is identified; consequently, the only overall alternative to the development of the Mungada Ridge Hematite Project is not proceeding with the project.

Notwithstanding these constraints, the project development concept presented in this PER represents the current optimisation of engineering, economic, environmental and social considerations. Further optimisation will occur during detail design.

6.18.1 Not Proceeding with the Project

The direct consequences of not proceeding with the project can be summarised as follows:

- The social and economic benefits described in Section .3, such as wages, royalties and taxes, would be lost at all levels, i.e., local, regional, state, national and international.
- In particular, direct full-time employment at the mine during operations and additional indirect jobs created elsewhere as a result of the mine's existence would not be available.
- The physical, biological and social impacts (presented throughout this PER) associated with the development of a well-managed mining operation located in an isolated setting would not occur.

6.18.2 Alternatives Considered in Project Planning

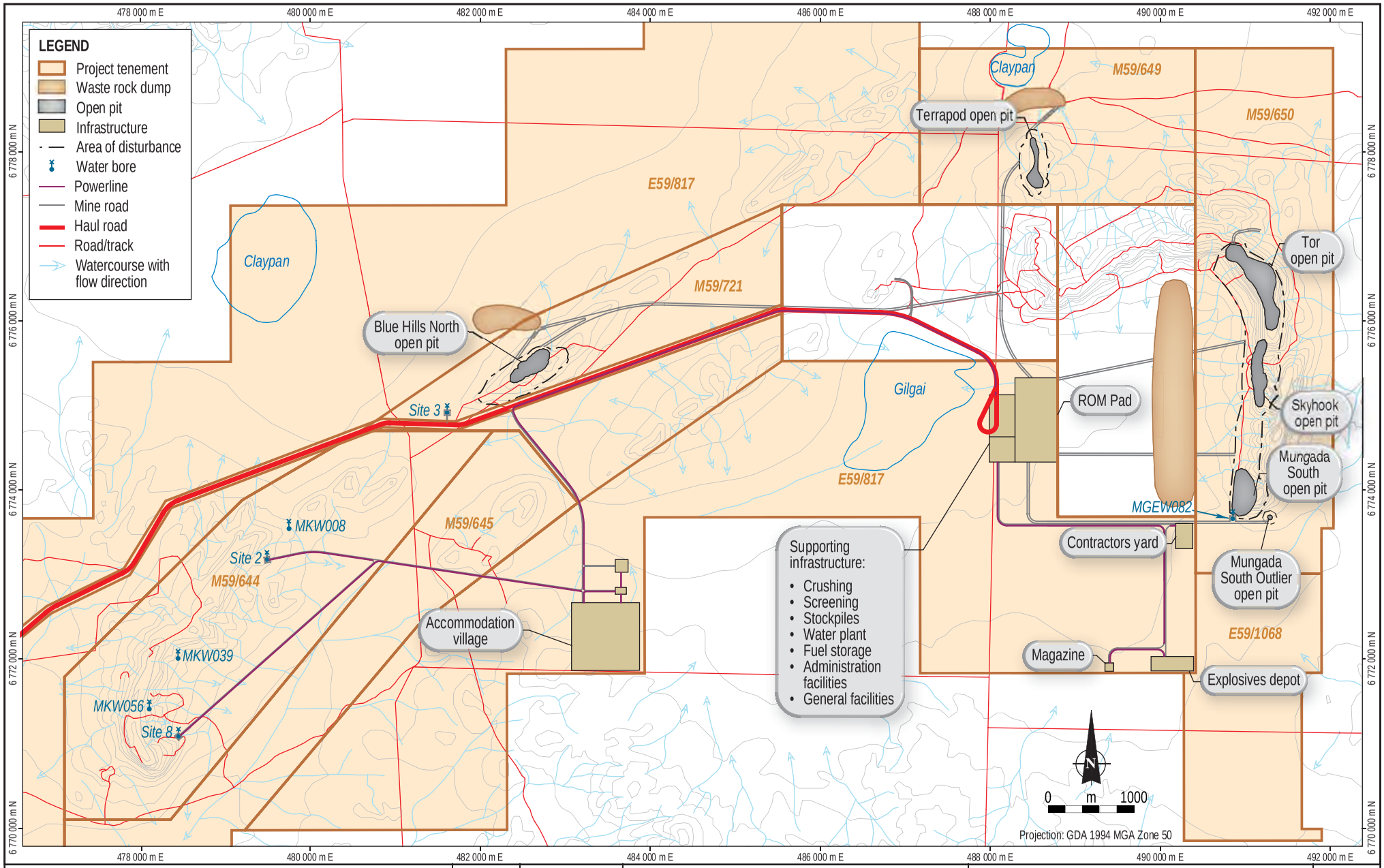
Mining

Given that hematite ore occurs as surface outcrops, all mining will be undertaken using relatively shallow conventional open pit mining methods, underground mining is not feasible.

A number of waste rock dump locations, profiles and rehabilitation alternatives have been considered. Potential environmental and economic impacts, as well as practicality, were considered for each option. Figure 6.20 presents an alternative waste rock dump location. This option is subject to negotiations with the tenement holder, Midwest Corporation, and the results of a sterilisation drill program.

Backfilling of the open pits was considered as part of rehabilitation and mine closure. As detailed in Section 6.17.9, the option was discounted as it would prevent future access to magnetite ore that may occur at depth below the known hematite deposits.

With respect to crushing and screening, mobile and fixed plants were both considered. A mobile plant was discounted due to the potential increase in disturbance footprint and the increased risk of hydrocarbon spills.



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Karara Management Services Pty Ltd

Mungada Ridge Hematite Project

Minesite layout - alternative option

Figure No: **6.20**

A number of alternative locations were considered for support infrastructure. Economic and environmental factors were considered in the selection of the proposed locations, as were applicable regulations. An accommodation village will be constructed; residential accommodation in Perenjori and Morawa will be considered on an individual basis. The proposed work rosters have been selected to provide a balanced and healthy lifestyle and to attract suitable personnel.

Rail Siding and Haul Road

Two options for the location of rail siding, and thus the haul road, were considered: one at Morawa and the other at Perenjori. For either option, existing road alignments would require upgrading.

The Morawa transport option would require upgrading the existing Mungada Road, originally constructed by Western Mining Corporation over 40 years ago. Overgrown vegetation would require limited clearing back to the original road easement, and some sections of the road would require realignment to comply with Austroads requirements.

The Perenjori transport option would require upgrading a section of an existing unsealed road. The remainder of the route would require widening and forming a road over an existing unsealed track. A portion of this road would traverse a nature reserve and salt flat.

The Morawa option is the preferred option, given that it will require minimal additional clearing and will impose the least environmental impact.

Various alternative methods of transporting ore from the minesite to the rail siding were considered. Trucks significantly smaller than quadruple road trains, e.g., B-doubles, would increase truck movements on the road, hence reducing public safety on the road. The availability of the trains and the number of rail wagons per train is dictated by the rail network capacity; hence, KMS cannot control whether loading will be undertaken 24 hours a day or only in daylight hours.

Given the size and number of trucks required, the road transport of product all the way through to the port was deemed undesirable due to reduced public safety and economic considerations. Extension of the rail line to the minesite and construction of a rail siding at the minesite was deemed economically unviable given the relatively short duration of the project.

Port Facilities

The Port of Geraldton is the closest existing port to the minesite; hence, the preferred option.

The proposed Oakajee Port was considered as an alternative; however, it will not be developed in time to meet the project's export schedule.

Various locations for infrastructure within the Port of Geraldton were considered. Developing Berth 7 was considered; however, it would have required construction of new infrastructure and filling of the existing void at the berth. While Berth 5 has limited storage area, the Geraldton Port Authority has allocated the existing ship loader for use by KMS. Berth 5 also provides the shortest conveyor distance between the proposed product storage shed and the ship loader.

The product storage shed design was based on the area of land available and the storage capacity requirements, as well as to ensure existing services at the port are utilised as much as possible, such as power and stormwater management structures.

The largest vessels the Port of Geraldton can handle are Panamax class; hence, no larger vessels were considered.

Services

Power. The power requirement for the construction and operation of the minesite is 2.5 MW. KMS considered three supply options:

- On-site diesel generation.
- Installation of a power line to access power from Oxiana's Golden Grove operation.
- Utilising the 132-kVA line along the existing road to Morawa.

Current information indicates that on-site diesel generation is the most viable option for the project. Diesel generators can be located where required and moved as necessary. Minimal additional clearing will be required for installation of the diesel generators, compared to the larger clearing requirements associated with the installation of a power line.

Water. Project water demand arises from dust suppression activities and potable water used in accommodation and workshop facilities. A number of options were considered and investigated:

For the minesite:

- Ground water extracted from fractured rock aquifer within the project area.
- Oxiana's Golden Grove operation.
- Silverstone Mine, controlled by Monarch Gold Mining Company Ltd.
- Rothsay Mine, controlled by Royal Resources Ltd.
- Palaeodrainage aquifers, including Mongers Lake, Weelhamby Lake, Nullewa Lake and Yarra Yarra Lakes.

Minesite water options were assessed on the basis of haulage rates, potential bore yields and the salinity of each water source. Due to the arid climate, available surface water resources in and around the minesite area are limited and did not warrant further investigation.

At the rail siding, KMS has been advised that scheme water from the Shire of Morawa will be available for non-operational water use. KMS is continuing to investigate options to supply the rail siding with sufficient water.

Water at the port will be supplied via existing scheme water connections, and there are no other viable water sources readily available in that area.