Department of Environment
and Resource Management

Environmental Impact Statement (EIS) Report under the Environmental Protection Act 1994

Dugald River Project
Proposed by MMG

November 2011

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1 Introduction

This report provides an evaluation of the environmental impact statement (EIS) process under Chapter 3 of the *Environmental Protection Act 1994* (EP Act) for the Dugald River Project proposed by the Minerals and Metals Group Pty Ltd (MMG).

Zinifex Australia Limited applied for the relevant mining leases in 2004 and in addition to further exploration works, commenced environmental studies on the project. An application to prepare a voluntary EIS was granted by the former Environment Protection Agency (now the Department of Environment and Resource Management, DERM), and draft terms of reference (TOR) were advertised in April 2008. Following a period of public consultation the TOR were finalised in August 2008. Zinifex Australia Limited subsequently underwent a merger with Oxiana Limited and became OZ Minerals Australia Limited. MMG purchased the project in June 2009 and is now the proponent for the Dugald River Project.

DERM has coordinated EIS process for Dugald River Project Being the administering authority for the EP Act. This assessment report has been prepared pursuant to Sections 58 and 59 of the EP Act. Section 58 of the EP Act lists the criteria that the DERM must consider when preparing an EIS assessment report, while section 59 sets out the required content of the assessment report.

The Act requires that this EIS assessment report must:

(a) address the adequacy of the EIS in addressing the final TOR

(b) address the adequacy of the draft environmental management plan (EM Plan)

(c) make recommendations about the suitability of the project

(d) recommend any conditions on which any approval required for the project may be given.

In providing the required content, this assessment report summarises key issues associated with the potentially adverse and beneficial environmental, economic and social impacts of the Dugald River Project. It also discusses the management, monitoring, planning and other measures proposed to minimise any adverse environmental impacts associated with the project. In addition, it discusses those issues of particular concern that were either not resolved or require specific conditions for the project to proceed.

Chapter 2 of this EIS assessment report outlines the nature and scope of the project in order to provide context for the findings of the report. Chapter 3 outlines the EIS process followed for the project and the approvals that would be necessary for its commencement. Chapter 4 addresses the adequacy of the EIS, discusses the main issues with regard to the environmental management of the project, and outlines the environmental protection commitments made in the EIS. Chapter 5 of the report assesses the adequacy of the EM Plan for the project in incorporating the environmental protection commitments and meeting the content requirements of section 203 of the EP Act. Chapter 6 makes recommendations for conditions to be included in the draft environmental authority (EA). Chapter 7 makes recommendations for any approvals required by the project.

The giving of this EIS assessment report to the proponent will complete the EIS process under the EP Act.

2 Project details

Zinifex Australia Limited took control of the existing mining leases for the project in 2004 and commenced further exploration on the project site in 2008. The company commenced environmental studies and the current EIS process in early 2008. In August 2008, Zinifex Australia Limited underwent a merger with Oxiana Limited and became OZ Minerals Australia Limited. OZ Minerals completed a feasibility study of the project and a preliminary draft EIS in early 2009. MMG purchased the project from OZ Minerals Australia Limited in June 2009 and is now the proponent for the Dugald River Project.

The Minerals and Metals Group Pty Ltd (MMG) is the proponent for the Dugald River Project and proposes to develop a zinc, lead and silver metals mine located approximately 85 kilometres (km) north-east of Mt Isa and 60 km north-west of Cloncurry, in north-western Queensland. The project area consists of 33 existing mining leases (ML) 2467-71, 2477-82, 2496-99, 2500-02, 2556-59, 2596, 2599, 2601, 2638, 2684-85, 7496, 90047, 90049 and 90050-51), one mining development lease (MDL) 79 and five mining lease applications (MLA) 90211-13, 90218 (water pipeline route), and 90220 (powerline route). Also included are three parcel prospecting permits (PPP) 90553, 90554 and 90555. The location and layout of the project is shown in Figure 1.

The overall project area is approximately 3,426 hectares (ha) and the project would include the mine itself, as well as key infrastructure components comprising: a processing plant, water storage dams, waste rock dumps, a tailings storage facility (TSF), access and haul roads, and an accommodation camp.

MMG currently holds a Standard Level 2 Environmental Authority (EA) for mining activities on the existing MLs. MMG has also submitted a Plan of Operations for exploration activities on these tenements. According to the EIS, the landholders and EPM holders under the powerline corridor have been engaged by MMG and agreements are in place with the owners of the Roseby Copper Project for development of the access road and water pipeline corridors.

The zinc/lead/silver resource estimated for the project totals 53 million tonnes (Mt). The expected mine life would be more than 23 years with a mining rate of 2 million tonnes per year (Mt/y) of zinc, lead and silver ore and up to 1 Mt/y for the copper resource. Total concentrate production for the mine at full production would be approximately 523,000 t/y of concentrate consisting of 408,000 t/y of zinc/silver concentrate, 40,000 t/y of lead/silver concentrate and up to 75,000 t/y of copper concentrate. Processing of the zinc/lead/silver ore would be through a conventional flotation and concentrating plant. Processing of the copper resource would be through a separate conventional copper concentrator circuit.

The deep zinc/lead/silver and copper ore would be mined from underground by conventional mechanised methods (longhole open stoping) that would involve drilling and blasting the ore and waste rock. The mine would be approximately 1.6 km in length along the strike and 1,000 metres (m) deep. It would be accessed by twin declines that would also be used to haul ore and waste rock from the mine in diesel powered trucks. The mine would be ventilated via five vertical shafts.

The twin declines would separate the mine into two distinct operating areas, the South Mine and the North Mine. Each area would have independent networks for ventilation, power, water and drainage and they would be joined by a single link drive approximately 300 m below the surface. The mined out voids would be backfilled with rock fill, waste rock, or paste fill from process plant tailings.

A separate processing plant circuit is proposed for the zinc/lead/silver ore and the copper ore. The processing plant designs for each type of ore have a single processing line that includes a jaw crusher, stockpile conveyor, coarse ore stockpile, semi-autogenous grinding and ball mill grinding circuit, flotation circuits that include regrinding mills, concentrate dewatering, concentrate loading and tailings thickening facilities.

Once full-scale mining operations begin, the mine would run 24 hours a day, 7 days a week.

In the western section of the project, ephemeral creeks drain into Cabbage Tree Creek, which is a tributary of the Leichhardt River. Ephemeral watercourses in the eastern section of the project drain in an easterly direction emptying into the Dugald River. The Dugald River runs adjacent to the project site and is a tributary of the Flinders River which flows into the Gulf of Carpentaria 450 km from the project site. Downstream of the project site, water is mainly used for stock watering. Raw water for the project would be supplied from the Lake Julius / Ernest Henry

pipeline which passes to the north of the project. A take off point was included during construction of the pipeline to allow access to water from the pipeline for future mining operations in the area around the Dugald River.

The main energy supply during the operational phase would be from the Mount Isa electricity grid system which is provided by gas fired power stations. Diesel generators would provide power during the project's construction. Natural gas would also be used on the project site for water heating. Natural gas would be supplied to site by a local LPG supplier.

During the construction phase, the on site workforce would peak at approximately 650 persons. An accommodation camp would be located on a plateau on the Knapdale Range, and would provide up to 650 rooms with capacity to expand to 750 rooms if required. At peak production the project would employ an on and off site workforce of approximately 575 workers across the mining, processing and administration fields. Of this workforce approximately 500 persons would be accommodated on site at any one time. Most employees would be on a fly-in-fly-out roster.

The layout of the project site including the tailings storage facility, process water dam, accommodation camp, mine and processing area is shown in Figure 2.

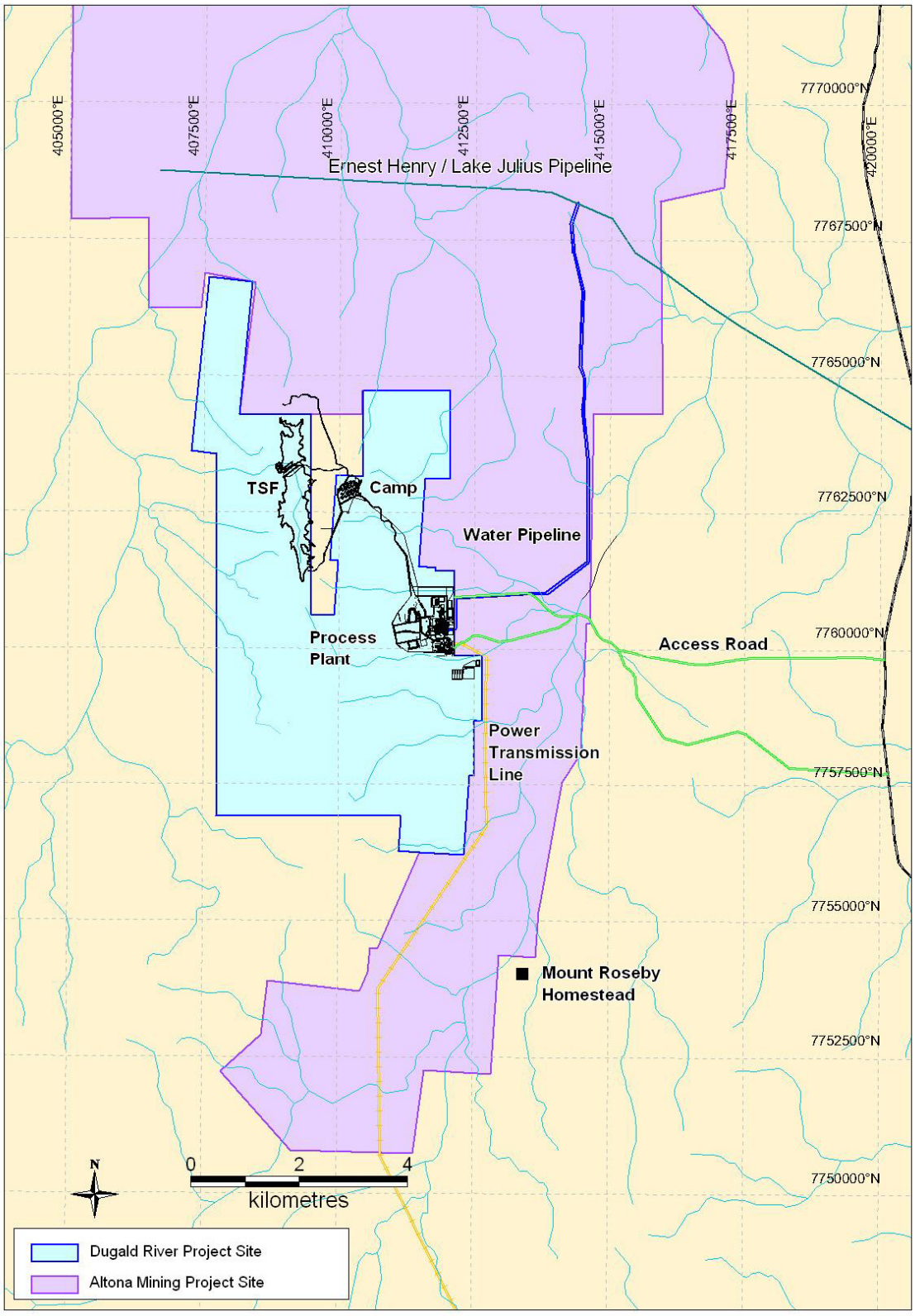

Figure 1 Project location and infrastructure layout

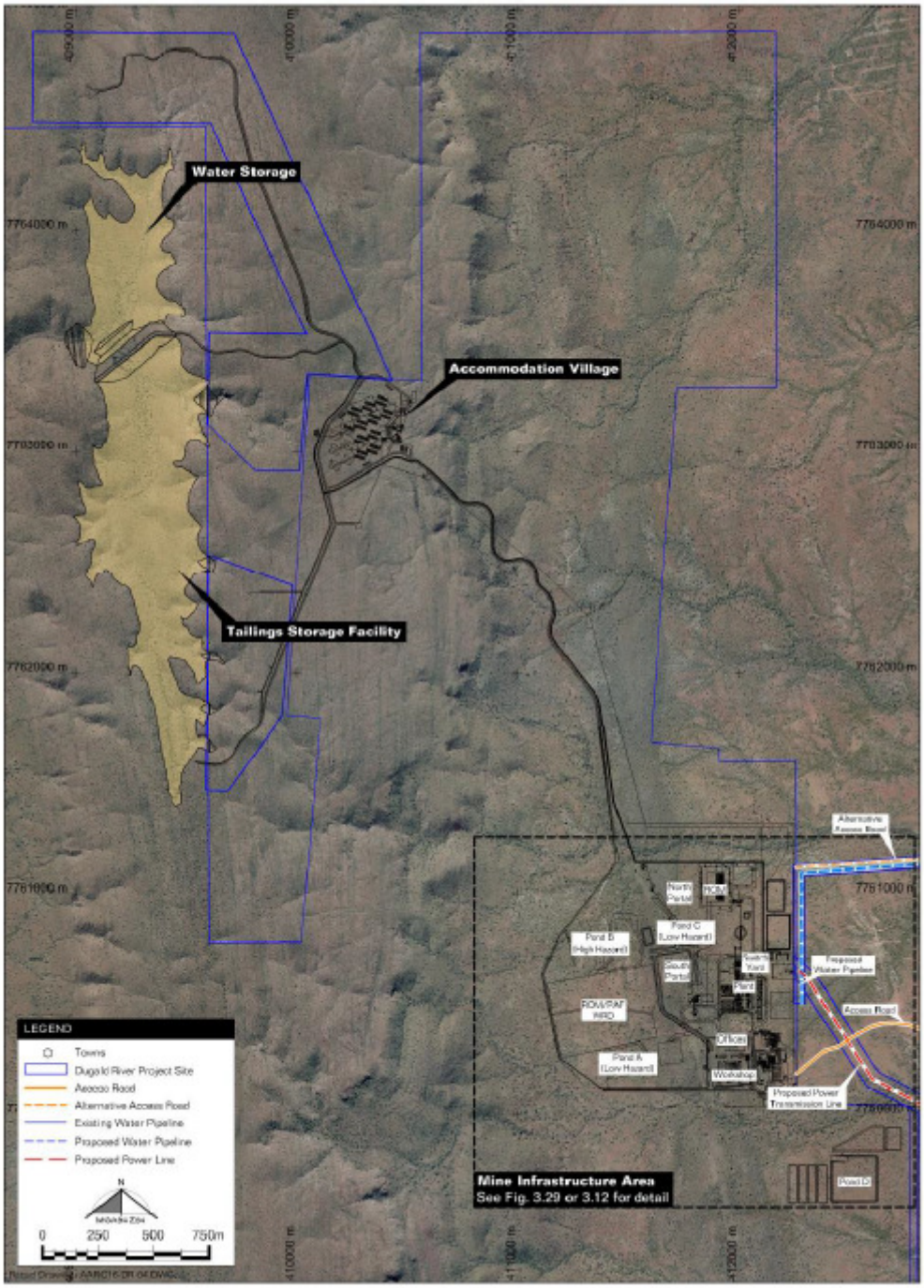

Figure 2 Project layout

3 The EIS Process

3.1 Timeline of the EIS process

On 11 March 2008 Zinifex Australia Limited applied to prepare a Voluntary EIS for the project under section 70 of the EP Act. This application was approved by the (then) Environmental Protection Agency.

The draft terms of reference (TOR) and initial advice statement for the EIS were submitted on 12 March 2008.

A notice of publication of the draft TOR was issued on 10 April 2008. A public notice of the comment period for the draft TOR was placed on EPA's website on 11 April 2008 and advertised in the Courier-Mail and the Mt Isa North West Star on 12 April 2008. The comment period on the draft TOR started on Monday 14 April 2008 and closed on Tuesday 27 May 2008. Comments were received on the draft TOR from nine stakeholders within the comment period. These comments, together with those provided by DERM, were forwarded to the proponent on 10 June 2008.

Zinifex Australia Limited provided a response to the comments and recommended changes to the draft TOR on 23 July 2008. DERM considered that response and all comments received on the draft TOR, prior to issuing the final TOR on 21 August 2008.

In August 2008 the proponent, Zinifex Australia Limited merged with Oxiana Limited and became OZ Minerals Australia Limited. The Minerals and Metals Group acquired the project from OZ Minerals Australia Limited in June 2009.

The EIS was due to be submitted in August 2010. In July 2010, MMG applied for an extension to the submission deadline for the EIS. An extension of time was granted until August 2011, on the basis that the project had not changed significantly from its initial advice statement. However, relevant legislative and policy changes had occurred since the TOR were finalised, meant that these changes needed to be addressed in the submitted EIS. These were addressed by including an addendum to the final TOR, which was issued on 20 August 2010.

MMG submitted an EIS on 8 October 2010. DERM reviewed the EIS and on 5 November 2010 advised that the submitted EIS did not address the final TOR in an acceptable form and was not suitable to proceed to public notification. MMG was asked to make a number of changes and these requirements were outlined in a formal information request. On 12 December 2010, a revised EIS was submitted by the proponent and on 17 December 2010 DERM decided that the EIS adequately addressed the TOR and the information contained therein was of an acceptable form for the EIS to proceed to notification. On 17 December 2010, a notice of that decision was issued to MMG. The public submission period for the EIS was set at 30 business days, commencing on 24 January 2011and continuing until close of business on 7 March 2011.

The EIS notice announcing the submission period for the EIS was published on DERM's website on 21 January 2011, in the Courier-Mail on Saturday 22 January 2011 and in the Mount Isa North West News on Wednesday 26 January 2011.

Under the EP Act, MMG was required to provide copies of the EIS notice to all affected and interested persons. On 2 February 2011 MMG provided the required statutory declaration that the public notice requirements for the EIS had been fulfilled.

Six submissions on the draft EIS were received within the submission period. Five submissions were from Queensland Government Departments and one from a landholder. All submissions were accepted in accordance with section 55 of the EP Act. The submissions, together with a submission from the DERM were forwarded to MMG for consideration and response. To enable MMG to properly address the matters raised in the submissions, the deadline given for MMG to respond to the submissions was extended until 22 July 2011.

On 18 July 2011, MMG provided a supplementary report to the EIS addressing the submissions. Copies of the response to submissions were distributed to all who had provided comments. DERM, on the basis of its own review and the reviews of submitters decided that additional information was required from MMG to adequately address several matters raised in submissions on the EIS. Consequently, on 15 August 2011, DERM decided (under s. 555 of the EP Act) to extend the deadline for a decision (under s.56A of the EP Act) on whether the EIS

should be allowed to proceed, until 26 September 2011. This extension was made to provide MMG with the time to prepare and submit the additional information. On 16 September 2011, MMG provided DERM with both the additional information and a revised environmental management plan.

On 26 September 2011, under s56A of the Act, DERM decided that the submitted EIS (which includes the submitted EIS, the Supplementary Report and the additional information) was adequate to proceed to the preparation of the assessment report. A notice of that decision was given to MMG on 4 October 2011.

In the preparation of this EIS assessment report, consideration has been given to submissions and comments from the advisory bodies (see section 3.3.2 for a list of advisory bodies) and other interested parties made at all stages of the EIS process. This EIS assessment report will be available on DERM's website <www.derm.qld.gov.au>.

3.2 Approvals

MMG currently holds level 2 environmental authorities (EAs) for the mining leases that cover part of the project area. MMG will apply for a single environmental authority for the project covering all existing and new mining tenements for the mining project.

The project will also require a new mining lease for the tailings storage facility (MLA 90211).

MMG has nominated that the EA would need to cover the following activities that are directly associated with, or facilitate or support, the mining activities and which would otherwise require approval under the EP Act as environmentally relevant activities (ERAs). The following ERAs proposed to be conducted on the project, which would otherwise be ERAs as per Schedule 2 of the Environmental Protection Regulation 2008, if the project was not a mining project:

- ERA 8(3b) - Chemical storage: Storing more than 500 cubic metres (m^3) of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3
- ERA 8(4) - Chemical storage: Storing 200 t or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)
- ERA 15 - Fuel burning: Using equipment capable of burning at least 500 kilogram per hour (kg/hr) of fuel
- ERA 17 - Abrasive blasting: Permanent location or mobile and temporary
- ERA 18(a) - Boilermaking or engineering – producing 200 to 10,000 t of metal product per year by boilermaking, assembling, building or manufacturing
- ERA 21 - Motor vehicle workshop operation
- ERA 31(2)(b) - Mineral processing: > 100,000 t/yr
- ERA 43 - Concrete batching: 200 t/yr or more
- ERA 56(2) - Regulated waste storage: Receiving and storing regulated waste (other than tyres)
- ERA 60(1)(d) - Waste disposal: Waste disposal facility (any combination of regulated waste, general waste and limited regulated waste – and < 5t untreated clinical waste if in a scheduled area): > 200,00t/yr
- ERA 63(2)(b)(ii) - Sewage treatment – operating a facility for 100 to 1,500 equivalent persons with treated effluent discharge other than as in 63(2)(b)(i).

The EA application (and amendments) would need to list all the relevant ERAs, including relevant thresholds under schedule 2 of the Environmental Protection Regulation 2008 that would apply to the project.

3.3 Consultation program

3.3.1 Public consultation

In addition to the statutory requirements for advertising the TOR and EIS notices and the mailing of the notices to interested and affected parties, the proponent undertook community consultation with members of the public and other stakeholders during the public submission period for the EIS.

3.3.2 Advisory Bodies

DERM invited the following organisations to assist in the assessment of the TOR and EIS by participating as advisory bodies for the Dugald River Project:

- Former Department of Natural Resources and Water
- Former Department of Mines and Energy
- Former Department of Infrastructure and Planning, Sport and Recreation
- Former Department of Housing
- Former Department of Infrastructure and Planning (DIP)
- Former Department of Emergency Services
- Former Department of Primary Industries and Fisheries
- Former Department of Main Roads
- Former Department of Transport
- Former Commonwealth Department of the Environment, Water, Heritage and the Arts (DEWHA)
- Department of Communities (DOC)
- Department of Community Safety (DCS)
- Department of Education and Training
- Department of Employment, Economic Development and Innovation (DEEDI)
- Department of Transport and Main Roads (DTMR)
- Queensland Health (QH)
- Queensland Police Service (QPS)
- Queensland Treasury (QT)
- Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC)
- Queensland Rail Limited
- SunWater
- Cloncurry Shire Council
- Mount Isa City Council
- Southern Gulf Catchments
- Queensland Conservation Council
- The Wildlife Preservation Society
- Southern Gulf Catchments Group.

On 26 March 2009 and in February 2011 the structure and names of a number of State Government departments changed (see Public Service Departmental Arrangements Notice (No.2) 2009).

Table 3.1 summarises the machinery of government changes that occurred to Queensland Government departments referred to in this report.

Table 3.1 - Changes to Queensland Government departments

Previous department/s	New department (as of 26 March 2009)
Department of Primary Industries and Fisheries Department of Mines and Energy Department of Tourism, Regional Development and Industry Department of Employment and Industrial Relations Department of Infrastructure and Planning	Department of Employment, Economic Development and Innovation (DEEDI)
Environmental Protection Agency Department of Natural Resources and Water	Department of Environment and Resource Management (DERM)
Department of Local Government, Sport and Recreation	Department of Local Government and Planning (DLGP)
Department of Main Roads Queensland Transport	Department of Transport and Main Roads (DTMR)
Department of Communities Department of Housing Disability Services Queensland, Department of Child Safety	Department of Communities (DoC)
Department of Emergency Services	Department of Community Safety (DCS)

An advisory body briefing for the project was held in Brisbane on 4 February 2011 during the EIS public submission period. In addition, a field trip to inspect the project site was held on 24 February 2011.

3.3.3 Public notification

In accordance with the statutory requirements, public notification of the of the draft TOR and EIS and public comment periods was made through notices in The Courier-Mail, the North West News and on DERM's website.

The draft TOR and EIS were placed on public display at the following locations during their respective public comment and submission periods:

- EPA/DERM Websites: <www.epa.qld.gov.au> and <www.derm.qld.gov.au>
- Naturally Queensland Information Centre, 160 Ann Street, Brisbane (draft TOR only)
- Mount Isa Library, West Street, Mount Isa (draft TOR only)
- AARC, Swan Road, Taringa (draft TOR only)
- DERM Mount Isa Business Centre, Corner Camooweal and Mary Streets, Mount Isa
- DERM Referral Centre, 400 George Street, Brisbane (EIS only)
- Cloncurry Municipal Library, Corner Scarr and King Streets, Cloncurry (EIS only).

3.4 Matters considered in the EIS assessment report

Section 58 of the EP Act requires that an EIS assessment report consider the following matters:

- the final TOR for the EIS
- the submitted EIS
- the submitted supplementary EIS (SEIS hereafter)
- additional information submitted 16 September 2011
- the submitted environmental management plan (EM Plan) of 16 September 2011
- all properly made submissions and any other submissions accepted by the chief executive

- the standard criteria
- another matter prescribed under a regulation.

These matters are addressed in the following subsections.

3.4.1 The final TOR

All of the matters listed in the final TOR, issued on 21 August 2008, were considered when preparing this EIS assessment report. While the TOR were written to include all the potential major issues associated with the project, they were not exhaustive, nor were they to be interpreted as excluding other matters from consideration in the EIS.

Where matters outside of those listed in the final TOR were addressed in the EIS, those matters have also been considered in this EIS assessment report.

3.4.2 The submitted EIS

The submitted EIS was considered when preparing this report. The submitted EIS comprises:

- The EIS that was made available for public submissions on 24 January 2011 till close of business on 7 March 2011- referred to as the EIS in this report.
- The response to submissions and the amendments to the EIS received by DERM on 18 July 2011- referred to as the Supplementary EIS (SEIS).
- The response to additional information requested by DERM and the amendment of the SEIS received by DERM on 16 September 2011 - referred to as Additional Information in this report.
- An environmental management plan (EM Plan) received by DERM on 16 September 2011 - referred to as the EM Plan in this report.

DERM accepted 6 submissions on the EIS including submissions from:

- Department of Communities
- Department of Community Safety
- Department of Employment, Economic Development and Innovation
- Department of Transport and Main Roads
- Queensland Health
- Landholder.

The department also made its own submission on the EIS.

All of the Government agencies that made submissions were given the opportunity to review and provide comments on the SEIS. This included comments on conditions that should apply to the project and on the adequacy or otherwise of the SEIS in addressing concerns raised in submissions.

3.4.3 The standard criteria

Section 58 of the EP Act requires that, among other matters, the standard criteria listed in Schedule 3 of the EP Act must be considered when preparing the EIS assessment report. The standard criteria are:

a. the principles of ecologically sustainable development as set out in the National Strategy for Ecologically Sustainable Development
b. any applicable environmental protection policy
c. any applicable Commonwealth, State or local government plans, standards, agreements or requirements
d. any applicable environmental impact study, assessment or report
e. the character, resilience and values of the receiving environment
f. all submissions made by the applicant and submitters

g. the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows -
   i. an environmental authority
   ii. a transitional environmental program
   iii. an environmental protection order
   iv. a disposal permit
   v. a development approval

h. the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument

i. the public interest

j. any applicable site management plan

k. any relevant integrated environmental management system or proposed integrated environmental management system

l. any other matter prescribed under a regulation.

The department has considered the standard criteria when assessing the project.

3.4.4 Prescribed matters

Section 58 of the EP Act requires that the following matters prescribed, under the Environmental Protection Regulation 2008, are considered when making an environmental management decision for this project:

- Section 51, matters to be considered for environmental management decisions
- Section 52, conditions to be considered for environmental management decisions
- Section 53, matters to be considered for decisions imposing monitoring conditions
- Section 55, release of water or waste to land
- Section 56, release of water, other than stormwater, to surface water
- Section 57, release of stormwater
- Section 60, activity involving storing or moving bulk material
- Section 62, activity involving acid-producing rock
- Section 64, activity involving indirect release of contaminants to groundwater.

3.4.5 Notifiable activities

The EIS identified and listed the following relevant notifiable activities under schedule 3 of the EP Act that would apply to the project:

- Notifiable activity 1 - Abrasive blasting – carrying out abrasive blast cleaning (other than cleaning carried out in fully enclosed booths) or disposing of abrasive blasting material.
- Notifiable activity 7 - Chemical storage (other than petroleum products or oil under item 29) – storing more than 10t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous good code.
- Notifiable activity 15 - Explosives production or storage – operating a factory under the *Explosives Act 1952*.
- Notifiable activity 24 - Mine wastes –
  - (a) Storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants.
  - (b) Exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.

- Notifiable activity 25 - Mineral processing – chemically or physically extracting or processing metalliferous ores.
- Notifiable activity 29 - Petroleum product or oil storage – storing petroleum products or oil –

  (a) In underground tanks with more than 200 litre (L) capacity.

  (b) In above ground tanks with –
    - i. For petroleum products or oil in Class 3 in packaging groups 2 and 2 of the dangerous goods code – more than 2,500 L capacity
    - ii. For petroleum products or oil in Class 3 in packaging group 3of the dangerous goods code – more than 5,000 L capacity
    - iii. For petroleum products that are combustible liquids in Class C1 or C2 in AS 1940 – more than 25,000 L capacity.

MMG will be required to provide notification to the Contaminated Lands Register for all notifiable activities and the identified notifiable activities should be clearly identified and listed in the EM Plan. Any notifiable activity, as defined under Schedule 3 of the EP Act would be a relevant mining activity if it is directly associated with, or supports or facilitates, the mining or processing of silver, lead, zinc or copper on the Dugald River Project tenures.

3.5 Environment Protection and Biodiversity Conservation Act 1999

The EIS states that the Dugald River Project is unlikely to impact on Matters of National Environmental Significance under the *Environment Protection and Biodiversity Conservation Act 1999*. The proponent did not refer this project to the former Department of Environment, Water, Heritage and the Arts (DEWHA), nor the current Department of Sustainability, Environment, Water, Population and Communities (SEWPaC).

4 Adequacy of the EIS in addressing the TOR

Table 4.1 lists the main aspects of the project addressed in the EIS and highlights the significant issues associated with those aspects. The table notes whether the submitted EIS has adequately addressed the matters described in the TOR. The subsections of this chapter enlarge on some of those significant issues, discuss the findings of the EIS in regard to them and outline the environmental protection commitments made by the proponent.

Table 4.1 Summary of the adequacy of the EIS in addressing the TOR

Matters included in the TOR	Significant issues	Were issues adequately addressed in the EIS?
Introduction	▪ Overview of the project, its objectives and scope ▪ Outline of the necessary approvals and their assessment processes.	Adequate
Project need and alternatives	▪ Project justification and any alternatives.	Adequate
Project description	▪ Location of the project in the regional and local contexts ▪ Description of the construction phase of the project ▪ Description of the operational phase of the project including operations, product handling, processing, infrastructure, energy waste and rehabilitation.	Adequate Adequate Adequate
Climate	▪ Climatic conditions at the site	Adequate
Land	▪ Geology of the proposed mine including the tailings storage facility and mine infrastructure ▪ Resource utilisation ▪ Land use ▪ Land disturbance ▪ Land contamination ▪ Landscape character and visual amenity.	Adequate Adequate Adequate Adequate Adequate Adequate
Waste	▪ Waste rock, particularly potentially acid forming rock ▪ Tailings from the mineral processing plant.	Adequate Adequate
Water resources	▪ Surface watercourses and overland flow ▪ Groundwater.	Adequate Adequate
Air quality	▪ Dust ▪ Greenhouse gases ▪ Other air emissions.	Adequate Adequate Adequate
Noise and vibration	▪ Noise at sensitive receptors ▪ Noise impacts on wildlife ▪ Vibration due to blasting.	Adequate Adequate Adequate
Nature Conservation	▪ Terrestrial plants ▪ Terrestrial animals ▪ Aquatic ecology ▪ Groundwater dependent ecosystems ▪ Matters of national environmental significance.	Adequate Adequate Adequate Adequate Adequate
Cultural heritage	▪ Indigenous cultural heritage ▪ Non-indigenous cultural heritage.	Adequate Adequate
Transport	▪ Transportation of personnel by road ▪ Impacts of fly-in, fly-out workforce	Adequate Adequate

Matters included in the TOR	Significant issues	Were issues adequately addressed in the EIS?
	▪ Transportation of ore concentrates by road.	Adequate, but matters concerning the proposed loadout facility need to be further addressed in future environmental approvals
Other infrastructure	▪ Accommodation options and locations ▪ Processing options ▪ Fuel storage areas ▪ Equipment hardstands and maintenance area ▪ Technical workshops and laboratories. ▪ Power line easement	Adequate Adequate Adequate Adequate Adequate Adequate
Social	▪ Impacts on local community ▪ Impacts due to fly-in, fly-out workforce.	Adequate Adequate
Health and safety	▪ Air, noise and water emissions. ▪ Road haulage Cloncurry	Adequate Adequate
Economy	▪ Alienation of grazing land. ▪ Effects on the local economy. ▪ Effects on the state economy.	Adequate Adequate Adequate
Hazard and risk	▪ Unplanned discharges to air, water or land. ▪ Transportation, storage and use of hazardous substances. ▪ Emergency response.	Adequate Adequate Adequate
Rehabilitation and decommissioning	▪ Rehabilitation of areas affected by mining activities ▪ Decommissioning the project, in terms of the removal of plant, equipment, structures and buildings	Adequate Adequate

4.1 Introduction

The EIS has provided an adequate introduction to the project, its objectives and scope. It adequately identifies the necessary approvals and outlines the relevant assessment and decision-making processes.

4.2 Regulatory approvals

The EIS has provided an adequate summary of the purpose of relevant legislation and regulatory approvals required for the Dugald River Project.

Table 4.2 - Approvals required for the Dugald River Project

Approval	Legislation (Administering Authority)
Environmental authority (mining activities) covering the project area of 33 existing MLs, one MDL, five MLAs, and one MDL Application,	*Environmental Protection Act 1994* (Department of Environment and Resource Management)
The Dugald River Project requires mining leases to be approved for MLAs 90211-90213, 90218 and 90220.	*Mineral Resources Act 1989* (Department of Employment, Economic Development and Innovation)
Cultural Heritage Management Plan (CHMP)	*Aboriginal Cultural Heritage Act 2003* (Department of Environment and Resource Management)

4.3 Project need and alternatives

The EIS describes the need for the project and briefly outlined the social, economic and environmental benefits and costs. The positive and negative impacts, appropriate mitigation and management measures and environmental protection commitments for the project have been addressed in later sections of the EIS.

The nature of mining projects often dictates that specific interdependent activities must be undertaken at particular locations. Consequently, there can be limited options for the effective configuration of mines, related mining activities and ore processing facilities, without rendering such projects financially or logistically viable . The key components of the Dugald River Project: the ore resources, the processing plant, key infrastructure and personnel, need to be located within a reasonable distance of each other for the project to be profitable and sustainable. Every additional kilometre of ore haulage and personnel travel, decreases efficiency, thus increasing energy consumption, emissions and ultimately decreasing project value. The preferred mining method in the EIS was underground mining due to the nature and location of the ore body. This has benefits over open cut mining, by reducing waste rock generation and avoiding generation of overburden.

DERM requested additional information on power supply options (for example including solar for the accommodation facilities and gas for the processing plant) and the feasibility of using a combination of methods of power supply. MMG responded that power generation based on renewable energy sources alone is not economically viable for the Dugald River Project. Additionally the inaccessibility and limited economic viability of most renewable energy sources prohibit the use of most combinations of renewable and conventional energy sources for the project. The four main technologies that were considered as sources of power included solar, wind, hydro and geothermal. The wind and hydro resources in the region are not considered adequate for providing power to the project.

4.4 Project description

The EIS adequately described the location, scope and phases of the project. A brief outline of the project is found in section 2 of this report.

The zinc/lead/silver resource estimates defined for the project totals 53.0 million tonnes (Mt) at a cut off grade of 6 pre cent (%) zinc (as of July 2009). The average zinc grade of the ore is 12.5%, lead is 1.9% and silver is 36 ppm. The copper resource defined for the project totals 3.4 Mt (as of June 2010) at a cut off grade of 1 % copper. The average copper grade is 1.8%, gold is 0.3 parts per million (ppm), cobalt is 105 ppm and molybdenum is 60 ppm. Installation of a copper processing circuit would be subject to the successful proving up of sufficient resources from currently identified areas of copper mineralisation. Additional feed may also be sourced by toll treatment of third party ores. After mining factors and cut off grades are applied the recovered ore is approximately 41.3Mt at 11.8% zinc, 1.8% lead and 36 ppm silver. The extraction of the economic portion of the resource would be maximised by the use of cemented paste fill in conjunction with a bottom up mining sequence.

The Dugald River zinc-lead resource would be extracted using the sublevel open stoping mining method, with 25 m sublevel interval and the use of paste fill. Sublevel open stoping is a mechanised bulk mining method delivering a moderately low cost mining option. The resource would be accessed via two declines to increase productivity and reducing required development. This method has been selected to maximise productivity whist controlling hanging wall dilution while maximising mine head grade. The material handling system would be via truck to the surface. Other options such as conveyor and shaft haulage were investigated as part of the project pre-feasibility. Shaft haulage would continue to be investigated as additional resources at the site are discovered.

The Department of Employment, Economic Development and Innovation's (DEEDI's) Mines and Energy – Minerals Division requested a clearer demonstration of how the mineral resource would be recovered by way of examples at the theoretical mine planning stage. DEEDI also required information on the effectiveness of the mining proposal in achieving the optimum utilisation of the mineral resources within the project area.

In response, the SEIS stated that the proposed mine design incorporates the use of paste fill which would allow as close to full recovery of the known zinc-lead resource as practicable. The use of paste fill allows for 100% extraction of the ore by eliminating the use of mining pillars to maintain stope stability. None of the identified resources would be sterilised by any planned infrastructure and the use of paste fill would minimise the amount of ore sterilised in mining pillars.

All the major features of the project including ore processing, tailings management, waste rock, stormwater drainage and storage, transport, water supply, power and waste management have been adequately described in the submitted EIS.

4.5 Climate

The EIS adequately described the local climate with regard to how the climate could affect the potential for environmental impacts and the management of operations at the site. The principal aspect is the effect of seasonal rainfall on water management on site to prevent the release of unauthorised contaminants from the site. Furthermore, bushfire mitigation measures such as establishing fire breaks and prohibiting the lighting of open fires on the project site are proposed to minimise bushfire risk during the peak fire season during winter and into spring.

4.6 Land

The EIS adequately described those aspects of the site and project related to the existing and proposed qualities and characteristics of the land. Geologically, the Dugald River Project site is broadly made up of Dugald slates and Knapdale quartzite. The stratabound base metal ore deposit is found in the black slate environment striking north-south.

The following subsections address land qualities and characteristics in more detail.

4.6.1 Land disturbance

The project would have the potential to disturb in total approximately 611 ha of land in the first two to three years of construction and operation. This would include 297 ha on the main project site and 314 ha on the surrounding infrastructure corridors and access roads.

The EIS described how, prior to the development of any infrastructure on the project area, topsoil and vegetation would be removed from the footprint area and stockpiled. Large vegetation would be pushed first and windrowed alongside the area where topsoil would later be stockpiled. Stockpiled vegetation would be chipped or used whole in revegetation works at a later date. Where possible, topsoil stockpiles would be located on relatively flat areas and would not be located on steep slopes. Rainfall runoff would be directed away from stockpile areas, and runoff from the stockpile area itself would be controlled with either a small earthen bund or sediment ponds downstream. Where topsoil stockpiles would remain in place for an extended period (greater than 1 year), stockpiles would be ripped and seeded to encourage water infiltration, prevent erosion and maintain a viable seed bank. The stockpiles would be seeded with a quick establishment species.

The three main areas that would be disturbed would be the processing plant/mining area, the accommodation camp area and the Tailings Storage Facility (TSF). Other corridor areas that would be disturbed include roads, the power transmission line, water pipeline and tailings pipelines. The EIS proposed to return the majority of disturbed land to a condition similar to the pre-existing condition of low intensity grazing, native habitat or an agreed beneficial use with exception of the TSF area and Non-Acid Forming (NAF) waste rock dump. These would be returned to native habitat as they are prone to increased erosion if grazing would be allowed to occur on these final landforms. The water pipeline and power transmission line would be retained on mine closure as this infrastructure may be of beneficial use to the region or future mining operations.

The EIS described that there would be limited opportunity for progressive rehabilitation on the project as the surface footprint area would be required for the infrastructure throughout the life of the mine. Some areas of the NAF waste rock dump would be available for progressive rehabilitation in the later mine life. A Final Land Use And Rehabilitation Plan was outlined in the SEIS which described the full rehabilitation strategy to be employed for each land disturbance type and rehabilitation completion criteria. This is discussed in more detail in Section 4.19 of this report.

The EIS outlined that on completion of mining, the underground declines and the box cut disturbance areas would be returned to safe and stable landforms, representative of the intended post mining land use. Rehabilitation methodology would include capping of the vertical declines with a concrete plug, backfilling of the vent raises and box cut with NAF material and spreading of topsoil and revegetation of the final landform surface. By sealing the

underground declines with specifically designed concrete plugs the chances of subsidence into the underground workings would be greatly reduced. This methodology would ensure that the proposed subsequent land use is not compromised by surface instability or erosion.

DERM requested more information on predicted subsidence levels. MMG responded that due to the relatively small size of the open voids underground long term subsidence would be localised and minimal. Other surface entries such as ventilation and egress shafts would also be filled and capped with concrete to prevent subsidence. Surface subsidence due to production activities (stoping) was predicted to be extremely unlikely as a suitable crown pillar height would be applied, stope widths would be limited, rib pillars would be left for stope stability close to the surface, and tight filling would be undertaken. For both short and long term stability stopes on the highest shall be "tight" filled via bore holes drilled from the surface. Tight filling the stopes would prevent stope failure and therefore prevent surface subsidence both short and long term. Furthermore, the SEIS outlined that surface infrastructure, such as waste rock dumps and dams, would be located in areas that where surface subsidence would not occur.

Biosecurity Queensland commented on several aspects of weed and pest management in the EIS, such as the effects of land clearing on the increase of weed and pest species, the frequency of weed monitoring and animal pest management. Similarly, the underlying and adjacent landholder on Roseby Station, in comments on the EIS, requested that a weed management strategy be developed and implemented from the commencement of operations (exploration and mining). The landholder endorsed the implementation of a wash down facility for all vehicles coming onto the site and for checking of vehicles before entering the site. In response, the SEIS contained amendments to the EIS and EM Plan updating weed and pest management on site, including improved pest monitoring strategies for weeds and animals, as well commitments to implementing a pest control program and strategies to prevent the spread of weeds.

It is recommended that conditions in the draft EA take into consideration the commitments made in the EM Plan for weed and pest management during mine operation and that rehabilitation requirements also minimise the potential for weed and pest invasion post mining.

4.6.2 Land use

The EIS identified grazing of cattle and mineral exploration/mining as the main feasible current and future land uses for the project site, especially given the high quality of the mineralisation present and the history and culture of mining in the region.

4.6.3 Soils and land suitability

Appropriate field and laboratory assessments were undertaken for the project site and six main soil types were identified. The results showed a complex mixture of topographical and geological features on the project site that made soil classification difficult. The six soil types were identified as a pre-mining land use suitability class of 5 for broad acre cropping and 4 for conservation. Red Plain and Pocket soils were also identified as pre-mining land use suitability class of 4 for beef cattle grazing and the Knapdale, Miners and Prospectors soils were identified as class 5.

The predominate soil types are the Red Plains and Knapdale covering 2959 ha of the project site at a depth of up to 50cm. The Dale and Prospectors soil management units cover only 203 ha with the Dale being deeper soils (50 to 70cm) and the Prospectors are very shallow and skeletal soils. All these four soil types were slightly to moderately acidic non-saline, non-sodic soils while the Miners (covering 166 ha) and Pocket (48 ha) soil management units were slightly to moderately alkaline non-saline, non-sodic soils. All six soil types had exchangeable sodium percentage values less than 6% making them non-dispersive and resistant to erosion.

No good quality agricultural land was identified on, or adjacent to, the project site. There was also no land, adjacent to, or in the vicinity of the project, currently used for urban development, recreation or tourism. The land surrounding the project is covered by pastoral leases, exploration permits or mining leases. Pastoral use and mining are the predominant land uses in the region and there are no currently existing or potential land uses that might be incompatible with the final land uses proposed for the project site.

On closure and decommissioning of the project, MMG proposed to return the majority of disturbed land to a condition similar to the pre-existing condition of low intensity grazing, native habitat or an agreed beneficial use.

The TSF area would be returned to native habitat rather than a mix of native habitat and low intensity grazing. This is because this area may be susceptible to increased erosion if grazing was allowed to occur on these final landforms. Most of the stormwater dams, sediments ponds and roads on site would be returned to their pre-mining land use and suitability unless the landholder wishes to retain these structures for grazing purposes through a written agreement with MMG. The water pipeline and power transmission line would be retained on mine closure as this infrastructure may be of beneficial use to the region or future mining operations.

Most of the erosion potential on these soils originates from the short duration, high intensity rainfall events that occur during the summer period. However, mining landforms and infrastructure are the most likely areas to be eroded by wind and water. Hence, the EIS outlined management strategies, erosion monitoring and remedial works to manage potential impacts from erosion.

DERM requested further information on potential impacts of changing land suitability on native fauna (especially in relation to the potential for erosion in the area of the TSF and the NAF waste rock dump) and how the risk of significant erosion could be prevented if stock did not have access. In response, the SEIS stated that the Potential Acid Forming (PAF) waste rock, which would have had the largest potential impact, has been removed from the surface waste rock storage (the PAF waste would be returned underground); therefore reducing the biggest risk of contamination of surface and ground water due to the project. Native species used for rehabilitation within the TSF and NAF waste rock dump areas would be those which are less palatable to stock. The TSF area and NAF waste rock dump would be appropriately rehabilitated, by means of ripping, contouring and seeding. An erosion monitoring program would further be maintained until the rehabilitation effort is documented successful. The final landform slopes would be contoured to a height to width ratio which promotes stable landforms. The water pipeline and powerline infrastructure would remain for future use. Associated maintenance roads may provide a weed seed corridor through otherwise untraversed habitat. Further information on rehabilitation and decommissioning can be found under Section 4.19 of this report.

DERM requested that erosion measures would need to be implemented to limit erosion during bulk earth work during construction. In response, MMG proposed erosion controls throughout all components of the construction phase as the EIS identified clearing of vegetation and exposed disturbed areas as posing the greatest risk for erosion from wind and water. The following measures were proposed to reduce the erosion of cleared and exposed disturbed areas:

- Clearing and disturbance would be limited to areas immediately before they are required for earthworks to limit erosion from wind and surface water runoff.
- Cleared areas would be watered to prevent wind erosion if they are to be left exposed.
- Sediment dams and diversion drains would be constructed as required for all cleared areas to prevent excessive runoff over cleared areas and to catch sediment leaving cleared areas.

4.6.4 Resource utilisation

The proposed mine design incorporates the use of paste fill which would allow as close to full recovery of the known zinc-lead resource as practicable. None of these resources would be sterilised by any planned infrastructure the use of paste fill would minimise the amount of ore sterilised in mining pillars.

The project would also provides for the utilisation of potential mineral resources that may be identified in the future. These could be:

- In addition to the zinc and lead processing circuit, the project plans to construct a copper circuit once sufficient resources are identified.
- Underground mining would produce less waste, resulting in a smaller area covered by waste rock dumps which often sterilise unidentified mineralization, or increase the future cost of extracting those minerals.
- Selection of 220 kilovolts (kV) as the powerline distribution voltage means that, with only Dugald River using the line, there is additional capacity to economically transmit power to other potential users in the area.

The zinc/lead/silver resource estimate defined for the project totals 53 Mt at a cut off grade of 6 % zinc. The average zinc grade of the ore is 12.5%, lead is 1.9 % and silver is 36 ppm. The copper resource defined for the project totals 3.4 Mt at a cut off grade of 1 % copper. The average copper grade is 1.8%, gold is 0.3 ppm, cobalt is 105 ppm and molybdenum is 60 ppm. Installation of the copper processing circuit would be subject to the

successful proving up of sufficient resources from currently identified areas of copper mineralisation. Additional feed may also be sourced by toll treatment of third party ores.

4.6.5 Land contamination

During the soil assessment the only soil type to record metal levels above the contaminated land thresholds in is the Miners soil type which recorded 839 milligram per kg (mg/kg) of lead. All other five soil types were below threshold levels. As there has been no previous mining in the area, it is assumed that this lead level is due to the mineralisation in the area.

The Environmental Management Register (EMR) and the Contaminated Land Register (CLR) were searched for the properties underlying the project site. The EIS reported that that there were no parcels of land on the EMR and CLR in the project area.

The EIS identified the following notifiable activities that would be conducted on the site, including:

- Mineral processing – chemically or physically extracting or processing metalliferous ores.
- Mine wastes – storage of hazardous mine or exploration wastes, including for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants; or exploring for, or mining or processing minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.
- Explosive production or storage - operating a factory under the Explosives Act 1999. An explosives factory means a place described in an explosives manufacturer licence where explosives are manufactured under the license.

In accordance with section 371 of the EP Act, once MMG becomes aware of any notifiable activity being carried out on the Dugald River Project area, or the land is being contaminated by a hazardous contaminant, MMG must give notice to the department's EMR/CLR Registrar of the all relevant notifiable activities that would require recording on the EMR. The proponent of the activities on the registered site would be required to provide a management plan for the site(s) to prevent the contaminant from posing a risk to the environmental or human health. The EMR would provide information about the site that is searchable for any future owners or users of the site.

Other sites that may trigger the need for notifying the EMR/ClR Registrar are accidental spills, such of fuel oils, and operational activities that could not be completely remediated.

Upon the cessation of mining operations, a site contamination assessment would need to be undertaken at all sites potentially contaminated during mining activities. During the decommissioning phase soil testing would also be conducted to around the processing plant and mining areas to determine if any land contamination has occurred due to concentrate or mineralised ore handling. Contaminated materials would be excavated and disposed of to the NAF waste rock dump or the TSF, prior to their rehabilitation. Furthermore, the EIS stated that a site remediation plan would be developed to achieve land suitability targets nominated for the project. This may include remediation plans already included in the project's EM Plan, such as that for the TSF and waste rock dumps.

4.6.6 Landscape character and visual amenity

The landscape character is described as flat semi-grassed areas, undulating open woodlands with many rocky outcrops. The slopes of the Knapdale Ranges were dominant in the landscape and include a combination of rocky scree slopes and sheer rock walls. The Knapdale ranges were sparsely vegetated mostly with Spinifex and Snappy Gum open woodland.

The project site has undergone moderate changes since European settlement. On the eastern side of the Knapdale Ranges the pastoral lease holder has used the land for cattle grazing and much of the flatter grassland areas have been disturbed. The western side of the Knapdale Ranges appeared to have had less grazing pressure as it is located further from the pastoral station and associated cattle infrastructure. The Knapdale Ranges were a continuous expanse of rocky outcropping hills that run north-south through the length of the project site. The Knapdale Ranges are inaccessible to the public with no existing tracks.

The Dugald River deposit was discovered over 100 years ago and small scale prospecting, exploration and mining operations have been undertaken and some dilapidated shafts still exist. Exploration activities would be focused on

the eastern side of the Knapdale Ranges. As such there are exploration tracks and drill holes present in addition to a small exploration camp, a core shed and roads.

The EIS concluded that the project is not expected to significantly impact on the landscape character of the region. No aspects of the project would be readily visible to any members of the public with the exception of the landholder traversing the pastoral lease.

Some broad-scale changes to topography would result from project operations. The main change would result from the valley-fill TSF. On decommissioning, the surface of the TSF would be capped, topsoiled and the surface would be seeded with a variety of local plant species to establish native vegetation. Once this vegetation had been established it is envisaged that the facility would blend into the natural surroundings. The rehabilitation strategy for the waste rock dump would include reducing the slope of the faces to prevent erosion, promoting the establishment of vegetation and assisting with the blending of the waste rock dump with the surrounding topography.

4.7 Transport

The EIS adequately described the arrangements for the transportation, importation or exportation of plant, equipment, materials, products, wastes and personnel during both the construction and operational phases of the project.

The following subsections address transport requirements in more detail.

4.7.1 Road

The EIS indentified a range of transport vehicles to be used for the project. Land Cruisers would service the majority of personnel movements required within the project site. Coaster buses and coaches would move personnel between the project site and Cloncurry airport. Triple road trains, b-double road trains, single trailer trucks, and single trucks would be used to traffic supplies from Cloncurry, Townsville and other supply centres.

Haulage of concentrate between the on site concentrating plants and the concentrate rail loading facility in the Cloncurry area would be handled by 105 tonne (t) capacity quad road trains, which would be covered to prevent loss of concentrate and dust emissions. The operation of the Dugald River Project would involve the mining of 3 Mt/y of ore, and produce approximately 523,000 t/y of zinc/lead/silver and copper concentrate which would translates to approximately 1,432 t per day of concentrate being transported off site, which would require about 14 quad road train trips a day.

During the construction phase, the majority of equipment would be transported from Townsville via the Flinders Highway, Railway Street, Hensley Drive and then the Burke Developmental Road or from Mount Isa, via the Barkly Highway and the Burke Developmental Road. Transport of equipment and materials would be via semi-trailer, low loaders, haul tankers and on occasion, escorted oversize semi-trailers.

The total number of people employed by the Dugald River Project would be 795 persons. It is anticipated that employees would be on an 8 day on, 6 day off fly-in fly-out arrangement via the Cloncurry Airport. Transport between site and the airport would be mainly by bus.

The project is expected to cause increases to traffic volumes on all roads, particularly the Burke Developmental Road. Increases on road infrastructure above 5% would require consultation with the Department of Transport and Main Roads (DTMR) to determine whether any extra mitigation procedures would be required for the project. Ongoing consultation would need be undertaken with the DTMR and the Cloncurry Shire Council during the final detailed transport design of the project.

Under the *Mineral Resources Act 1989*, the haulage plan proposed by the project constitutes a notifiable road use as it exceeds an annual haulage rate of 50,000 t. Under this arrangement, the mining tenement holder is liable to compensate the road authority for any cost, damage or loss it incurs, or would incur, which is caused by the notifiable activity. Arrangements between the project proponent and the respective road authorities, the DTMR and the Cloncurry Shire Council would need to be undertaken to satisfy this requirement.

In the EIS, an assessment of the transport infrastructure, as to its capacity to safely transport this increased traffic, suggests that the majority of the intended routes would satisfactorily handle the projected volume of haulage.

The DTMR commented that a check should be made to ensure that State-controlled roads that have been excluded from further analysis as the projected use does exceed 5% of the Average Annual Daily Totals (AADT), do not exceed 5% increase in Equivalent Standard Axles (ESA) in accordance with DTMR's guidelines. DTMR also recommended that the SEIS assess the traffic generation data for Landsborough Highway since the Yurbi Rail Loading facility (one of the proposed sites for the loadout facility) is located about 3 km away from the Flinders Highway and Landsborough Highway intersection. Further analysis was required to determine the geometric design standard to be used, based on templates for Type 2 road trains at the area off the turn-off from the Burke Development Road.

MMG responded that the existing transportation assessment suggests that further investigation into road impact is likely to be required as the AADT is expected to grow by 5% (the trigger limit set by DTMR) as a result of the project. To account for the ESA data, an additional addendum report has been compiled as part of the SEIS which models the future traffic environment. This addendum report details the growth in ESA during both the construction and operational phases of the project. Given ongoing project developments regarding the preferred transport routes during operation, significant changes have been made to the transportation assessment in the SEIS that includes assessment of impacts on the Landsborough Highway. An appropriate channelised or auxiliary type intersection would need to be selected from the Department of Main Roads – Road Planning and Design Manual during the detailed road design phase, which should be undertaken in liaison with DTMR. Furthermore, the MMG committed to obtaining appropriate permitting under section 46 of the Transport Operations (Road Use Management – Mass Dimension and Loading) Regulation 2005 for any trips involving excess mass, excess loads or over dimension vehicles.

DTMR has advised that the following requirements should apply to the project regarding Road Impact Assessment and Road-Use Management Plan.

Prior to the commencement of any construction works on site, the proponent shall:

- Review and finalise the road impact assessment (RIA) must that include details of all of the project's transport impacts on the safety and efficiency of state-controlled roads and proposed mitigation works/contributions to address these impacts, in accordance with Guidelines for Assessment of Road impacts of Development (2006) and a Pavement Impact Assessment methodology (to be provided by the DTMR North West office) in consultation with the Manager (RS&C) of DTMR North West Office; then submit the RIA to the Manager (RS&C) DTMR North West Office for review and approval.
- Prepare a road-use management plan (RMP) for the use of all state-controlled and other roads for each phase of the project. The RMP must detail traffic volumes, proposed transport routes, required road infrastructure maintenance and/or upgrades to mitigate road impacts, any necessary conditions about access/connection to public roads, transport scheduling, dust control and road safety. The RMP must also include arrangements to ensure compliance with the management of workforce movements associated with the project. DTMR must approve the plan prior to implementation.
- Prior to commencement of any construction works on site, the proponent shall prepare a Traffic Management Plan (TMP) for all construction and other activities in the state-controlled road corridor.
- Provide upgrade/improvement works and any necessary road maintenance works identified in the finalised RMP to ameliorate any adverse impacts of the road use by the project on the assets of DTMR.
- Obtain the relevant licenses and permits under the *Transport Infrastructure Act (Qld) 1994* for works within the state-controlled road corridor.
- Incorporate a provision that prior to commencing any program of oversize transport movements that may be required for the construction of the project, the proponent will consult with DTMR, the Queensland Police Service and Cloncurry Shire Council.
- Obtain the necessary permits for any excess mass or over-dimensional loads associated with the project as required under the *Transport Operations (Road Use Management) Act (Qld) 1995.*

Infrastructure Agreement

The proponent may enter into an Infrastructure Agreement with DTMR for:

1. Contribution or upgrade to the following intersections as determined and agreed upon with DTMR North West Regional Office
2. Burke Developmental Road (89A)/Dugald River Project access road; and
3. Any other intersection determined as being impacted by the project.

Rehabilitation and maintenance contributions associated with project traffic as calculated and agreed upon with DTMR North West Regional Office. This Infrastructure Agreement between the proponent and DTMR should be finalised prior to commencement of any construction works on site.

4.7.2 Rail

In the EIS, MMG originally considered the option of transporting concentrate by quad road train to BHP Billiton's Yurbi Rail Loading Facility for transport by rail to the Port of Townsville. However, since the submission of the EIS, MMG has decided not to pursue the option of utilising the Yurbi Rail Loading Facility due to the facility being used at capacity by its current operator.

MMG is now actively participating in discussions with the Cloncurry Shire Council (CSC) and other mining companies regarding the development of a Joint Loading Facility in the Cloncurry Area. Both CSC and the major mining companies involved are supportive of the concept and a potential site has been identified.

MMG is considering the option of transporting concentrate by quad road train to this new Joint loading facility east of the Cloncurry area, in the immediate proximity to the current Townsville/Mt Isa/Duchess rail line network and the Flinders Highway. It is anticipated that this facility would be built and operated by a third party and would cater for the needs of several mining companies.

An alternative option being considered by MMG and other mining companies would be transporting concentrate by quad road train to a proposed Joint loading facility, north of Cloncurry. It is expected this facility would also be developed and operated by a third party and would require an extension of the existing rail-spur. This facility would also include a totally enclosed concentrate shed which would hold the concentrate until it is ready to be loaded.

Queensland Rail (QR) operates a passenger service running two trips per week, carrying approximately 20 passengers each way. Queensland Rail National has developed a master plan for upgrading the Mount Isa rail network from the existing capacity to several scenarios which are detailed within the Mount Isa Rail Network System Master Plan Version 1 2009. The increase in supply to the rail network from the proposed Dugald River Project (and other mine proposals) has been included within this report.

In response to the haul road route options proposed in the SEIS, Queensland Rail has the following concerns with the impact of the additional traffic due to the project on level crossings. The change in haul routes to Loading Facility Options 1a, 1b or 2 means that haul vehicles will potentially cross over railway level crossings and therefore cause rail safety concerns. This is also the case if haulage to Option 2 (Ostojic facility) is chosen. It is noted that the Rocklands (Cudeco) EIS analysis of haul routes identified this same issue.

The locations of Loading Facility Options 1a and 1b are not identified sufficiently to determine if the haul routes cross rail level crossings and in this respect further analysis required as to rail level crossing impacts.

The haul route to Loading Facility Option 2 will cause haul vehicles to cross over crossing ID4037 Aerodrome Road/Sir Hudson Fysh Drive. The Rocklands EIS summarised the Queensland Rail Australian Level Crossing Assessment Model (ALCAM) risk assessment for this crossing as having a risk score of 551 (based on the existing crossing at time of assessment 1.10.2008).

Queensland Rail provided the following upgrade proposals for level crossing ID4037:

Proposal 1: Duplicated Give Way control signage ALCAM Risk Score = 297.

Proposal 2: Duplicated Stop control signage ALCAM Risk Score = 187.

Proposal 3: Flashing Light Assembly control ALCAM Risk Score = 158.

Given that the Dugald River mining project (and the Rocklands project) now potentially proposes further increases in road-haulage traffic transiting the crossing (under Loading Facility Option 2) it is considered essential that it be upgraded with flashing light arrangements.

Consequently, if the haul route to Loading Facility Option 2 is chosen, it is strongly recommended that the proponents commit to undertaking a revised ALCAM assessment and to implement those outcomes.

To progress implementation of this measure the proponent should liaise with both DTMR North West Regional Office (Cloncurry) and Queensland Rail.

DTMR has requested that MMG commit to the provision of satisfactory level crossing protection at the rail crossing ID4037 Aerodrome Road/Sir Hudson Fysh Drive. As a minimum this level crossing protection will be identified in a revised ALCAM assessment and comprise a flashing light assembly. Further investigations are to be carried out into the provision of flashing lights and boom gates in consultation with DMR (North West Regional Office - Cloncurry), Queensland Rail and the Cloncurry Shire Council.

The Queensland Rail contact for this purpose is Bruce Heazlewood, Project Manager, Network Projects, Telephone 3235 3177, GPO Box 1429 Brisbane Qld 4001.

4.7.3 Staff transportation

The EIS proposes the use of a 21 seat coach that would make up to two round trips per day from Cloncurry to the project site. MMG would also transport other workers to and from the airport via either a 21 seat coach or a 45 seat coach on Tuesday and Wednesday changeover days. It is expected that most staff would travel via the bus services provided, with a small number of light vehicles being used for travel to and from the site. Overall, this would represent an increase of up to eight vehicle movements per day on affected roads, a relatively small increase.

4.7.4 Port and Shipping

MMG intends to negotiate a commercial agreement with BHP Billiton to expand capacity at existing facilities at the Port of Townsville in order to allow for the storage and handling of the additional concentrates from the Dugald River Project. Permits and approvals for extension of the existing facility would be dealt with separately to this EIS and would be subject to any agreement with BHP Billiton.

Maritime Safety Queensland (MSQ), within DTMR, commented that the EIS stated that 385,000 t/y of product would be exported, requiring 13 to 15 ship arrivals per year. MSQ has advised that further information would be required on the potential impacts of the project from a marine transport perspective, including an assessment of whether the additional shipping required during the construction and operation of the project would have a significantly adverse affect on the operational safety and management of the port or incur any additional environmental impacts.

As a result of this comment, the SEIS includes additional information on maritime safety. The increase in number of vessel arrivals as a direct result of the Dugald River Project is estimated to be less than 2% increase in overall vessel movements per annum and therefore would not have any significant impacts on shipping operations in the Port of Townsville. The proposed product would require additional enclosed storage space which would be managed as part of the Port of Townsville's ongoing port management responsibilities. Any operational aspects of vessel management, environmental and safety matters at the port and berth during construction and operations would be detailed by BHP/MMG as part of a Construction Environmental Management Plan and Operational Environmental Management Plan submitted to obtain development approvals under the *Sustainable Planning Act 2009*.

4.7.5 Air

MMG intends engaging charter flights to provide commute flights between Cloncurry and Townsville airports. In addition to charter flights, intermittent use would be made of commercial flights from Cloncurry or Mount Isa to coastal centres.

The Cloncurry Airport is located approximately 4 km north of the Cloncurry Township. Qantas Airways services Cloncurry Airport several times each week. The Airport has the capacity to handle a variety of aircraft and it has been assumed for this assessment that the majority of employees would fly in and out of the Cloncurry Airport. The Mount Isa Airport is situated 85 km to the north-west of Cloncurry and is currently also serviced by Qantas Airways with significantly more flights than Cloncurry.

Current air transportation data shows that there are a total of 10 flights servicing Cloncurry each week, with an availability of 740 seats. Given that Cloncurry airport is the intended port for the FIFO operations, it has been a significant point of focus in the EIS assessment. The total number of mining personnel likely to be flying in and out of Cloncurry Airport for a given seven day week is expected to be approximately 134 persons per week during 2012, increasing to over 500 persons per week during 2027.

MMG advises that it intends negotiating a commercial agreement with an air services provider for dedicated charter flights between the commute base (nominally Townsville) and Cloncurry. It is anticipated that these flights would service the operations workforce using a 56 seat capacity Fokker F50 aircraft. In addition to the charter flights, during construction, and intermittently during operations, existing commercial flights that currently service Cloncurry would be used intermittently.

The EIS concludes that any negative impacts on the existing aviation industry would therefore be minimal.

4.8 Other infrastructure

The lead/zinc/silver processing plant would be constructed during the initial development of the project. The copper processing plant would be constructed at a later date, which is expected to be some time during 2015. Installation of the copper processing circuit would be subject to the successful proving up of sufficient additional resources from currently identified areas of copper mineralisation. Additional feed may also be sourced by toll treatment of third party ores.

The EIS identified some existing infrastructure in the vicinity of the Dugald River Project site. A water pipeline from Lake Julius to the Ernest Henry Mine passes above the northern portion of the project site in an east-west direction. This infrastructure is owned by the North West Queensland Water Pipeline Pty Ltd. The pipe runs underground, with valve pits and outlet points along the cleared track that marks the course of the pipeline. Existing outlet points are located immediately adjacent to the projects mining lease and will be used to access water for the project from the pipeline.

The project would be situated near a corridor through which the now disused (and removed) Kajabbi Branch rail line passed. It is anticipated that the corridor would be retained by the State as a future transport corridor.

4.8.1 Processing Plant

The processing plant would be located immediately to the east of the Dugald River deposit, near the eastern boundary of the project site. The EIS states that a sterilisation drilling program for the process plant area has been undertaken. The site was selected so that the Run of Mine (ROM) pads are close to the mine portals to minimise truck haulage distance, and to keep the ROM pad activities downwind of the terminal switchyard and administration area. There would be also a separate processing plant circuit for the lead/zinc/silver ore and copper ore.

DERM commented to MMG that the proposed plant location gave little consideration to the close proximity of the Silvermine Creek and Tributary A waterways. DERM recommended that alternative locations of the processing plant be assessed and that the potential environmental impacts of these alternatives be identified.

MMG responded that there are limited options for alternative locations as the ore body is located to the east of the Knapdale ranges and slopes from east to west. The process plant could not be built over the ore body due to the risk of subsidence. A possible location south of Silvermine creek contains copper resources and would be closer to watercourses than the selected location. The area to the north would be limited because of the proximity of the lease boundary to the Knapdale ranges. Although the site selected for the process plant is relatively close to the lease boundary to the east of the process plant, that location is the only viable location within the lease. Locating the plant on the lease would serve to minimise haulage costs from the mine to the plant. MMG further noted that significant attention had been paid to the proximity of the process plant in relation to adjacent waterways. The site selected for the process plant is approximately 500 m south of North Creek and 500 m north of Silvermine Creek. Alternative sites considered for the process plant on the lease would have been closer to waterways than the selected site. Finally, ponds will be required adjacent to the process plant to collect contain all runoff that could potentially have any impact on the adjacent waterways and in accordance with all regulations and guidelines. DERM considers that the location of the processing plant has been adequately addressed in the EIS documentation.

4.8.2 Power line

The EIS identified that the permanent power supply for the Dugald River Project would be sourced from a gas fired power station in Mount Isa. Transmission of the energy from Mount Isa would be via the existing 220 kV transmission line to the Chumvale substation, and then via a new transmission line to the project site. The proposed powerline corridor would extend approximately 60 km from the project site to Chumvale Substation, which would be located approximately 10 km west of Cloncurry on the Barkly Highway.

Three options where originally investigated for the route of this transmission line:

- Option 1: An overland route heading south-west from the project site then following a southeast route.
- Option 2: An overland route travelling directly south from the processing plant (not initially going southwest as in Option 1), and then following the southeast route of Option 1. This is MMG's preferred alignment.
- Option 3: A line running parallel to the Burke Developmental Road using the existing disused railway corridor and then following the same corridor as the Chumvale/Ernest Henry Powerline to the Chumvale substation.

DERM requested further clarification on the rationale for the preferred power transmission line route, as well as further information on the potential impacts on flora and fauna associated with the preferred power transmission line route. MMG selected Option 2 as the preferred option. The reasons offered for this selection in the SEIS included that it:

- avoided being too close to homesteads, infrastructure associated with grazing properties and the adjacent proposed Roseby Copper Project;
- involved suitability topography along the route;
- minimised disturbance of major watercourse crossings; and
- avoided rocky outcrops are associated with significant fauna habitat.

European cultural heritage assessment, vegetation mapping and identification of areas of fauna significance along the preferred powerline route were undertaken and the possible disturbance to sites of significance were assessed as part of the final preferred route location. In addition, Indigenous Cultural Heritage Management Plans have been entered into with both Traditional Owner groups for the proposed powerline route.

This assessment considers that the alignment of the powerlines has been adequately assessed and that the proposed impact control strategies outlined in the EM Plan are appropriate for the construction and operation of the powerlines.

4.8.3 Water supply pipeline

The EIS proposed a water pipeline to supply the project with freshwater. The average annual raw water requirement from Lake Julius for the project would be 477 Ml/y. MMG proposes that the water pipeline route would commence at the T-intersection of the Ernest Henry/Lake Julius Pipeline and would travel south and then west to the proposed process plant area within the Dugald River Project site. The corridor would be approximately 11.2 km long and would be an above ground pipe, mounted on concrete pedestals. The earthwork required for installation of the pipeline would be clearing and grubbing of the route, localised cut and fill to eliminate any isolated obstructions, and a road sub-base layer to shape the access road forming part of the corridor alongside the pipe. The water supply would be split so that some of the water is pumped to a raw-water tank at the accommodation camp and the bulk of the water would flow to a 1,915 m^3 raw-water tank near the process plant. There would be sufficient pressure in the Lake Julius/Ernest Henry line for the water to flow to the plant site. The pipeline would cross tributaries of Dugald River and Silvermine Creek at three locations.

DERM considers that the alignment and management of the water supply pipeline are acceptable.

4.8.4 Stormwater drainage

The proposed stormwater management outlined in the EIS seeks to separate clean water from potentially contaminated runoff from disturbed areas. This would be achieved by the construction of diversions and drains at the mine site, accommodation facility and the TSF.

To control dirty water runoff, stormwater dams and sediment ponds would be constructed downstream of the ROM pads, off ROM ore stockpile, waste rock dumps and other disturbed areas to capture rainfall runoff. Where this runoff is expected to be contaminated these ponds would be lined with HDPE and include a design storage allowance for a 1:100 Year, ARI two month wet season or a 1:20 Year, ARI two month wet season depending on their expected water quality and hazard rating. Sediment ponds for non-contaminated runoff would be designed to contain a 1:10 Year ARI, 24 hour event. Excavated material from constructing the stormwater ponds and sediment ponds would be used for constructing the ROM Pads, mine roads and used for fill underground where required.

In comments on the EIS, DERM requested information on the disposal of stormwater to the TSF. MMG responded that the disposal of excess stormwater to the process water dam would be undertaken only during emergency situations, to prevent an uncontrolled release of contaminated water from project storages (ponds A to G) into the receiving environment.

The TSF design in the SEIS had been revised from that in the EIS to include a process water dam within the TSF valley, which would contain decant water from the tailings and act as a storage for excess process and storm water. The process water dam would provide significant additional storage beyond that required for the TSF and Evaporation Dam Design Storage Allowance (DSA). It is proposed to utilise the additional storage available in the process water dam to provide a portion of the DSA for the high hazard stormwater dam. MMG proposes to install permanent pumping infrastructure to allow the transfer of contaminated water from the high hazard dams on the site into the process water dam.

In its comments on the EIS, DERM requested information on contamination levels and hazard categories of catchment areas and their respective storages, as well as a risk assessment that to consider environmental values of potentially affected waters and whether any additional contaminants would likely to be present in concentrations that would pose a significant risk of environmental harm if released. In response to these comments the EIS was amended to include details of storm water management storages and catchment areas, dam hazard classification, dirty water dams and contaminated (toxic) catchment areas and storages, as well as clean water diversions including the incorporation of a process water dam and pumping system to manage DSA requirements.

More information was requested by DERM in regards to the maintenance and monitoring program for sediments ponds/dams/TSF to determine the remaining capacity of the dams, as well as thresholds to instigate required maintenance. As a result the specialist reports and SEIS were amended to include a monitoring and maintenance plan for the proposed stormwater ponds and surface water control structures at the project site as well as the TSF and PWD. An Input/Outputs and Performance Section of the facility Operation & Maintenance Manual would formalise this key monitoring component. The data would form the basis of annual surveillance audits and would be used to assess and instigate required maintenance programs and in the design of subsequent stage raises and calibration of the site water balance model. Some of the key monitoring items would include the following:

- routine reconciliation of tailings discharge tonnages and solids concentrations,
- routine monitoring of tailings beach head and beach toe levels,
- routine monitoring of PWD mine water inputs and process plant return water rates, and
- annual field evaluation of tailings beach density and shear strength profiles.

DERM also requested additional information on potential environmental impacts in the case of failure to contain/breach of the dams and what control measures would be put in place in the case of such an event. MMG responded that the Guidelines for Failure Impact Assessment of Water Dams (DERM, 2010) indicate that none of the stormwater dams proposed for the project require a dam failure impact assessment. However, potential environmental impact in case of failure to contain/breach of the proposed dams have been assessed and discussed as part of the revised hazard categorisation in the SEIS.

Modelling water balance on the mine site in the EIS and SEIS shows that over the life of the mine, that there would be no controlled release of stored stormwater. However, provisions were made in the submitted EM Plan to allow for discharges. DERM requested details of the situations that are likely to occur that would require discharge from the mine site, how often this may occur as well was the conditions and limits (quality and quantity) that should apply to any proposed discharge. In response, the SEIS reported that, based on modelling of site water balance, that there was a possibility (1or 2 years in 120 years) of the sediment ponds and low hazard ponds discharging.

Commitments were made in the SEIS and EM Plan that, should discharge be needed, the quality of the discharge would be within ANZEEC limits (95th percentile) and that discharge would occur during appropriate natural flow events in the receiving watercourse. Site specific discharge water quality limits would be developed when further sampling of background water quality had been completed. MMG would apply to have the EA suitably amended once this data was available.

This assessment finds that the EIS documentation adequately describes the management of stormwater and water balance on site and that the proposed design, mitigation and management measures proposed would be adequate.

4.8.5 Borrow Pits

Borrow pits would be developed to source clay, gravel, sand, course rock and aggregate for road construction and fill for the development of the processing plant and mining areas. These materials may also be sourced from the processing plant area itself during the excavation of the numerous pond areas required or later from the underground mine development works. The main borrow pit area for gravel would be located to the south-east of the proposed processing plant area. Coarse rock and aggregate would be sourced from the cut material excavated during construction of the access road to the accommodation village and also from a rock quarry. The location of the rock quarry would be located on MMG's controlled tenure and would be identified following a geotechnical materials survey of the area.

4.8.6 Sewage

The EIS proposed a modular waste water treatment plant consisting of independent sewage and grey-water treatment facilities for the accommodation camp and the process plant. Each waste water treatment plant would consist of independent sewage and grey water treatment facilities, each fed by separate drainage systems. Treated grey water would be used for either subsurface irrigation to water the gardens and/or disposal to the PWD.

The sewage treatment plant at the accommodation camp would be discharged to the TSF during the operational phase of the project only. During the construction of the TSF, the sewage treatment during this time would discharge to a series of absorption trenches.

DERM commented that the level of treatment to be achieved by the sewage treatment plant had not been specified in the EIS, and no information to support the method of effluent disposal to trenches and the TSF and soil structure and properties in relation to the use of the absorption trenches during construction and operation of the mine was provided. MMG responded that the treated effluent would be Class C according to Queensland's Public Health Regulation 2005, that the SEIS had been amended to include a description of the proposed mine's waste management procedures as per the Waste Management Hierarchy (Environmental Protection (Waste) Policy 2000) and that absorption trenches would not be used. The effluent from the STP of the accommodation camp would be stored in an evaporation pond. This assessment finds that this matter has been adequately addressed.

4.8.7 Telecommunications

The project would not impact on any existing telecommunications infrastructure. A communications tower would be established adjacent to the proposed site of the construction and operations accommodation camp. In the meantime, ARAWsat communications system would provide stable communications during the early works phase and up to the establishment of permanent communications for the site.

4.8.8 Accommodation and other infrastructure

MMG initially sought alternatives of accommodating the workforce on the project site or in Cloncurry. However, the EIS identified the main disadvantage of having the workforce accommodated in Cloncurry is the distance that the workforce would need to travel each day to the project site (approximately 72 km each way). Such travel distances would introduce safety risks from driving fatigue and fauna fatalities along the road.

The total number of people employed by the Dugald River Project would be 795 persons. Employees would be on an 8 day on, 6 day off Fly-in Fly-out arrangement from the Cloncurry Airport and whilst on site, would be housed in purpose built camp style accommodation. The accommodation camp would be accommodating up to 622 rooms initially, with further capacity to expand to 766 rooms if required.

Three options for the location of the accommodation camp were assessed in the EIS:

- Option 1: On the western side of the Knapdale Range in the southern section of the tenements.
- Option 2: On a flat plateau on top of the Knapdale Range in the northern sections of the tenements.
- Option 3: On the eastern slopes of the Knapdale Range in the central section of the tenements.

The northern section (Option 2) was chosen as the most suitable location for an accommodation camp. This location would be on top of the Knapdale Range, which would provide attenuation from the noise of the plant and mine areas. This location would not sterilise any future ore resources. The total area to be cleared would be 8.2 ha of Snappy Gum woodland listed as of no concern under the *Vegetation Management Act 1999* and DERM's Biodiversity Status. Clearing of vegetation would be carried out with a grader and/or dozer, with topsoil being stripped by scrapers or dozers and trucks and placed nearby. The accommodation units would be delivered to site by road trains and lifted into place using cranes. Electricity and other communications cables would be overhead, to reduce trenching. The accommodation camp would be powered by two diesel generators for up to two years until the permanent grid connection is constructed and operational. Other infrastructure on site would include workshops, laboratories, administration building, mining offices, plant offices, security and gatehouse, warehouse, reagents store and control rooms.

DERM requested further information during the EIS commenting period regarding potential environmental impacts as such as air emissions from the processing plant and the TSF and the impacts of clearing remnant vegetation and habitats for significant fauna. In response the SEIS updated the air quality report to include predicted ground-level concentrations of dust and metals due to the processing plant and TSF. Furthermore, the footprints of each accommodation camp option have been investigated for habitat for significant fauna.

MMG revised the SEIS to include the camp as a receptor in the updated air quality report. Furthermore, impacts on nature conservation have been included in the updated ecology report in the SEIS.

MMG is also preparing a Social Impact Management Plan that would meet the requirements of the Social Impact Assessment Unit in DEEDI. This Plan has not yet been finalised. It will need to include details of accommodation.

4.8.9 Temporary on-site concentrate storage

DERM raised concerns regarding the capacity of on-site temporary concentrate storage in terms of possible flood impacts and possible incidents or conditions that would limit access to storage space at the rail loading facility or the Port of Townsville sites.

In response to DERM's concerns MMG provided additional information in the SEIS. The concentrate storage building on site would have a two-week storage capacity of approximately 16,000 t of zinc concentrate and 1,500 t of lead concentrate. The building would contain vertical filter presses to remove water from the concentrate prior to transport and areas to store different concentrates in segregated areas. The building would be fully enclosed with a concrete floor, including the truck loading area, to prevent contamination by metal concentrates to the outside environment, as well as ensuring concentrates remain free from external contaminants. This facility would also keep the concentrate trucks dry during loading operations. The concentrate shed would be located on a road loop that the trucks drive around clockwise as part of the loading process. The truck wash would be located at the exit of the shed so all concentrate trucks would go through the truck wash before leaving site. The truck wash would include shaker bars to help dislodge concentrate. Approximately 70% of the water used by the truck wash would be recovered for reuse, cleaned and stored for further use. Water runoff would be separated into clean and potentially contaminated water. Potentially contaminated runoff would be contained in a combination of lined stormwater dams and pumped back to the TSF.

DERM considers that this information adequately addresses its concerns.

4.9 Waste

The EIS identified that the inappropriate management and disposal of wastes may lead to the contamination of land and water with potential adverse impacts on human and ecosystem health.

The Dugald River Project's major sources of waste with the potential to cause impacts to the environment and to human health and well-being include:

- mine waste that may produce poor quality, saline or acid water runoff
- regulated wastes including, hydrocarbon contaminated wastes/materials, batteries, tyres, cleaning chemicals, vehicle wash down waters and detergents and solvents from workshop activities
- general waste including, timber and wooden pallets, green waste and domestic waste including, food scraps, wrapping paper from crib rooms, office administration and workshops areas
- recyclable materials including, paper and cardboard, glass and aluminium cans, scrap metal from workshop and office administration areas
- sewage waste including sewage effluent and dried sewage sludge from crib rooms and office administration areas.

The following subsections address waste management requirements in more detail.

4.9.1 Mine waste / Waste rock and Overburden

4.9.1.1 Tailing Storage Facility (TSF)

Tailings characterisation test work indicated that the tailing solids would have a high pyritic sulfur content and a correspondingly high capacity for acid generation, and are therefore classified as potentially acid forming (PAF).

Several options for the TSF were presented in the EIS: Six TSF sites were initially considered, two TSF sites were further developed to the conceptual design stage prior to selection of the preferred option:

- Option 1: A valley fill in a bifurcated valley on the western side of the Knapdale Range and approximately 4 km north-west of the processing plant.
- Option 2: An Upstream Raise Cell located on the relatively flat area 0.5 km south-west of the process plant site, south of Silvermine Creek and east of the hill known locally as “Copper Hill”.

Concerns were raised by DEEDI that option 2 would have the potential to sterilise significant copper and other mineral reserves. Subsequently, Option 2 was not considered further by MMG.

Following the submission of the EIS, DERM raised a number of concerns with Option 1 as proposed. These included the potential for contamination of groundwater or leakage to surface waters through faults and fractures in formations forming the valley, the substantial catchment (335ha) reporting to the TSF during operations hence a large DSA (3,250ML), the large area requiring capping and rehabilitation post mining, the impacts of clearing of remnant vegetation and disturbance of habitats for significant fauna and the risks associated with having one embankment holding all the tailings, decant water and run-on water. In consultation with DERM, several additional options were considered:

- Option 3: A valley fill variation to the one proposed in the EIS where the TSF concept would involve down-valley discharge of tailings to the tailings embankment, with all decant and runoff water conveyed via a gravity decant structure to a process water dam (PWD) directly downstream.
- Options 4 and 5: Two new valley fill variations located over two valleys on the eastern side of the Knapdale Range and approximately 1 km south-west of the processing plant. The TSF concept would consist of three separate impoundments operated in series which would allow for progressive rehabilitation. Surface water from each stage (maximum catchment area in operation at any time of 250 ha) would be transferred by pumping to the PWD located between these sites.

During further discussions with DERM and MMG a number of criteria were reviewed to determine the preferred option. These included sterilisation, earthworks volume, water management, environmental risk, rehabilitation, disturbance footprint and expandability. When reviewed against the decision criteria, Option 3 was considered to be superior to Options 4 and 5 due to lower earthwork quantities required, better potential for expansion, transfer of water to process water dam via gravity decant as opposed to pumping and lower risk to people. MMG also recognised the requirement for additional on site storm water storage, and hence the TSF scheme had been revised to include a separate PWD.

Option 3 would consist of a single large embankment, a down-valley discharge of tailings, and all decant and runoff water being stored within the tailings compound (i.e. no secondary water storage pond). The tailings containment would almost entirely be provided by the valley topography, with the main tailings retaining features being the main embankment on the west side, the eastern decant access embankment, and the northern discharge bunds. Additional on site storage of decant and storm water would be required which would involve the valley being sub-divided into a TSF and a separate process water dam (PWD). The TSF concept would involve down-valley discharge of tailings to the tailings embankment, with all decant and runoff water conveyed via gravity decant structure to the PWD directly downstream of the TSF. Tailings would be pumped up into the Knapdale Ranges from the process plant, running alongside the access road to the accommodation camp.

The preferred TSF design has been based on a mining inventory of 46.8 Mt of lead/zinc/silver ore, processed at up to 2 Mt/y over a 26 year mine life. The expected overall tailings production would be 36 Mt and the total tailings quantity for the TSF 22.8 Mt, assuming an overall proportion to underground paste backfill of 36.8%. The paste for back fill underground would equal approximately 620,800 t/y and final tailings approximately 931,200 t/y from processing of zinc/lead/silver ore. The required TSF capacity would be 15.2 million m^3.

It is planned that in 2017 the copper concentrator would be commissioned producing 19.5 million tonnes of copper tailings solids over the life of the mine. Zinc and copper circuit tailings would be combined with the carbon pre-flotation cleaner concentrate and pumped to the tailings thickener. The slurry would be thickened (50% to 55% w/w solids) then pumped to either the TSF or to the paste-fill plant for use in the underground mine operations. Disposal of copper tailings in the TSF would reduce its design life from 26 years to 13 years, necessitating a redesign and additional approvals to increase the capacity of the facility.

An access road to the TSF wall location would be constructed from the existing track on the western side of the Knapdale Range to allow for construction vehicle access. A 45 m high tailings embankment would be constructed of rockfill in three stages. The TSF concept would not include impoundment lining, relying instead on the natural characteristics of the site, and the proposed TSF operational methodology as a means of impoundment. Construction of tailings embankment will require an estimated 367,290 m^3 of rock fill and other materials for the full 3 stage construction. A further 165,800 m^3 of material for the Eastern Decant Access Embankment and the Northern Discharge bunds. This material will be sourced from within the valley where the TSF will be located.

The PWD would also be located in the valley downstream of the TSF. It would consist of a 32 m high embankment closing the valley outlet on the western side. This would create a storage capacity of 6,400 ML. The embankment would be rock filled with a geomembrane sealing system (GSS) on the upstream face. A decant water system would be used to feed decant water by gravity from the TSF to the PWD. Modelling indicates that the capacity of the PWD is sufficient to contain the maximum wet season excess water volume of 4,000 ML, and in combination with the TSF retain a DSA of 3,250 ML due to the large catchment (335ha) reporting to the TSF/PWD. The PWD will be constructed to its full height during the initial construction of the mine. A total of 160,340 m^3 of rock fill and other materials will be needed and this will be sourced from within the Knapdale valley and some from the NAF waste from underground mine and decline construction.

DERM also requested detailed geophysical and geotechnical testing of the proposed TSF/PWD site. In response a separate geophysical and geotechnical field mapping investigation (i.e. flood and seepage containment study) was carried out to determine the structural geology of the proposed TSF and PWD sites. The SEIS concluded that through the structural geology of the Knapdale valley has significant defects, which could extend to the TSF, it would be unlikely there is little risk of significant seepage occurring from the TSF, through the Knapdale Range rock mass, into the adjacent Cabbage Tree catchment. The Knapdale Range does not have an identified groundwater resource and investigations within the valley drainage outlet and the valley floor have shown low potential for infiltration of tailings leachate to the Knapdale Quartzite. The SEIS considered that there would be no risk of contamination to the hydrogeological regime as a result of low permeability tailings overlying intrinsically low permeability strata, and leachate would not contaminate surface water in the region. The only means of seepage within this locally saturated zone exiting the TSF valley would be through the drainage outlet on the western side. At this location the water-retaining PWD embankment would be constructed, including a 15 m deep grout curtain at the upstream toe, which would penetrate the upper 15 m of the foundation profile.

Following DERM raising concerns, three groundwater investigation bores were installed along the axis of the proposed TSF. The EIS reported that no free groundwater was found during drilling of the shallow bores.

Only minor groundwater supplies were found in deeper bores. Falling head permeability tests in the shallow and deep groundwater monitoring bores confirmed that the permeability of the Knapdale Quartzite beneath the proposed TSF is low. The low intrinsic permeability values recorded during hydrogeological studies indicated that the upper sequence to 10 m depth is unlikely to allow the seepage of decant water and drainage from tailings in the proposed TSF. Hence, the EIS concluded that there is little risk of contamination of the hydrogeological regime (including surface water) from low permeability tailings overlying intrinsically low permeability strata.

Concerns raised by DERM about the potential for emissions of dust (PM_{10}, $PM_{2.5}$, Total Suspended Particulates) and metals, due to wind erosion at the TSF (dry beach area), have been further quantified and were included in the updated air quality report in the SEIS. Wind erosion of the TSF would contribute up to 20% of the total dust emissions from the Dugald River Project. However, computer modelling indicated that dust from the TSF would not create unacceptable levels at any sensitive receptors.

DERM further commented that the main unnamed creek that traverses the TSF valley had not been mentioned in the EIS, nor had the valley functions as a catchment area described (e.g. collecting water runoff from the Knapdale Range). Any impacts and ecological consequences by filling this valley with tailing were not discussed in the EIS. Furthermore, the size of the valley to be filled with tailing is not specified. As a response to DERM's concern, an aquatic survey was conducted in the unnamed tributary of Cabbage Tree Creek to determine impacts of the TSF on the aquatic ecosystem. The SEIS concluded that the lineaments identified within the Knapdale valley are not representative of significant defects which could extend to the TSF. There is hence very little risk of significant seepage occurring from the TSF, through the Knapdale Range rock mass, which could impact the adjacent Cabbage Tree catchment.

MMG would conduct ongoing research of relevant closure experiences, and monitor the advancements in the subsequent regulatory requirements. Due to the characteristics of the tailings, the low design filling rate and the water management arrangements, closure of the TSF would be able to commence as soon as processing of tailings ceases and the PWD has been dewatered. The tailings profile within the TSF would have a final surface that would be self-shedding, thereby allowing closure of the TSF without the need for major re-shaping of the tailings surface.

The EIS stated that the depth of the cover would be sufficient to limit infiltration into the underlying tailings, whilst providing a generally stable moisture regime within the cover year-round. Whilst this conceptual closure system was considered by MMG to be commensurate with current best practice, prior to undertaking detailed design of the final capping system, MMG has committed to undertake the following:

- Numerical infiltration modelling and/or capping field trials once a better understanding of the tailings characteristics and the types of cover materials available on site has been established.
- Monitor developments in capping research and regulatory requirements, so that the final capping system adopted for the TSF can be based on demonstrable evidence of satisfactory performance, which takes years to develop.

DERM recommended that the details of how the risks of leakage from the TSF and PWD would be managed should be included in the SEIS. As a result the SEIS was amended to include visual inspections of the pipeline which would be carried out weekly by mill operators to ensure the integrity of the pipe and prevent leakage.

In the case of controlled releases from the significant and high hazard dams, release details were described insufficient in the EIS, EM Plan and EA conditions. DERM requested a detailed water management system and emergency strategies in the case of an overflow from the significant and high hazard dams. Consequently, the EM Plan and associated draft EA conditions were amended. These included that DERM would be notified and preparations would be made for preventative actions that would prevent uncontrolled releases. Infrastructure would be available for the emergency transfer of contaminated stormwater runoff to the TSF. However, the water balance model results indicated that based on 120 years of historical climate data, the high and significant hazard dams would be unlikely to spill, and as such the emergency transfer of water to the TSF would only be required if the 100 Year ARI critical wet season rainfall is exceeded within two months. Controlled releases from any of the proposed storages would only be undertaken where water contained in the dams would meet the quality criteria described in the SEIS, and during significant flow events in the receiving watercourses. Details of monitoring of stream flow in streams that may receive a release of contaminated water have been included in the amended EM Plan.

The final design of the TSF/PWD addresses DERM's concerns regarding the original design, particularly the reduction the long term risks posed by a single embankment for the TSF and decant water dam as well as providing added on site water storage capacity.

4.9.1.2 Waste Rock

The EIS adequately documented how the characterisation of the waste rock material was comparable with the requirements of the guideline on the Assessment and Management of Acid Mine Drainage (DME 1995) as required by the TOR. Of the lithologies likely to be encountered in the mine, the number of samples and their analysis was determined by the quantity of material in each lithologies. Of the 211 samples assessed, the proportions from the various lithologies were: 0.46MT of hanging wall slate had 18 samples; O.66 Mt of lode waste had 21 samples; 2.88 Mt of footwall slate had 43 samples and 3.11 Mt of footwall limestone had 45 samples. Testing on these samples included:

- Standard static testing including pH and EC, total sulfur content, Maximum Potential Acidity (MPA) Acid Neutralising Capacity (ANC), Net Acid Producing Potential (NAPP), and Net Acid Generation (NAG);
- Detailed analysis including sulfur forms, sequential NAG testing, kinetic NAG testing, kinetic NAG testing, acid buffer characteristic curves, solids multi-element analyses, water extractable elements, acid extractable elements and peroxide extractable elements; and
- Erosion potential testing including Cation Exchange Capacity (CEC) and Exchangeable Sodium Percentage (ESP).

Of the total of 7.3 Mt of waste rock that will be produced over the life of the mine, it is estimated that 75.9% will be NAF and 24.1% PAF. Of this, 62.6% will be disposed of underground, including all the PAF material at the cessation of mining. At the completion of mining, of the 2.7 Mt of NAF material produced 1,026,000 m3 of NAF material will be used in the rehabilitation of the TSF. During mining, a temporary PAF waste rock dump will be established on the mine site. PAF and high sulfur NAF will be encapsulated on the dump. The dump will be located and constructed to allow collection of runoff and seepage from the dump.

A NAF waste rock dump will also be established during mining operations for that NAF material not used in constructing infrastructure, returned underground as rock fill or used for PAF encapsulation. At mine closure most of the NAF rock would be utilised as cover material for the TSF. Therefore, a key consideration for use of NAF rock as final cover material is that it would produce seepage and runoff with a quality that would be acceptable for direct discharge or discharge after minor passive treatment.

The EIS originally proposed a single waste rock dump. However, DERM required further measures to prevent the ingress of water into PAF waste rock dump and further consideration of how the sides and top of the dump would be stabilised, safe, stable and non-polluting. Further information was required on how neutral mine drainage and saline mine drainage would be managed in relation to the proposed waste rock dump design. DERM further requested justification to support the requirement to leave the sediment dam in place at the base of the NAF/PAF waste rock dump.

As a result, MMG adjusted the waste disposal schedule and a PAF waste rock dump would no longer remain at the end of mine life. As PAF waste would be a relatively small percentage of total waste, and PAF rock would be preferentially used as backfill within the underground, the SEIS concluded that the volume requiring permanent surface storage would be accommodated within the core of the final dump structure in a manner that limits the potential for oxidation and thereby minimising the risk long term of ARD generation. The re-design would therefore negate the requirement for a sediment dam to be left at the base of the NAF/PAF waste rock dump at the end of mine life.

MMG proposed strategies to prevent or control acid rock drainage within stockpiles or dumps of pyritic waste rock such as:

- In-situ neutralisation of acid generation via blending of PAF rock with other materials that are non-acid forming, in particular high carbonate / low sulphide materials such as the footwall limestone or hanging wall calc-silicate.

- Minimisation of pyrite oxidation processes within dumped PAF waste via:
  - isolation and encapsulation of PAF rock
  - prevention of convective air movement
  - excluding PAF rock from the outer slope of dumps, the base layer of the waste rock dump, existing drainage lines so that the under-drainage is not in contact with sulfidic mineralised rock
  - limestone or calc-silicate would be placed in drainage lines to impart some alkalinity to drainage prior to emergence at the dump toe
  - construction of intermediate or final barrier layers which limit oxygen diffusion.
- Minimisation of acid drainage migration through surface drainage controls and incorporation of layers of low hydraulic conductivity.

The EIS also identified the possibility of high sulphide NAF rock and recommended that it would be identified prior to mining and selectively handled in a similar manner to PAF rock. Any stockpiled waste rock remaining at the surface at mine closure would have a final cover layer comprising only low sulphur NAF material.

Details of the measures that would be taken to manage waste rock dump on the surface both during mine life and post mining are outlined in the EM Plan. The proposed measures, provided they are competently engineered, constructed and managed, are likely to provide acceptable outcomes in terms of minimising and limiting contamination from waste rock.

4.9.2 Regulated waste

The EIS originally proposed an on site rubbish disposal site (landfill) for general waste located in the area west of the gravel/clay borrow pit. DERM commented that the EIS failed to address: alternative waste disposal options; how the types and volumes of waste disposed of at the site would be managed to prevent adverse on and off site impacts (including leachate); how waste would be segregated; and whether the Cloncurry Shire Council landfill would have the appropriate approvals to accept the types and volumes of waste proposed to be disposed by the mine. DERM further requested justification and details of consultation undertaken with Cloncurry Shire Council.

MMG responded that further project engineering and economic studies undertaken after the EIS was submitted resulted in the removal of the proposed on site waste disposal facility in favour of transportation of all waste to the Cloncurry landfill during both construction and operation. Therefore management of solid waste on site would be limited to the temporary storage of waste for transportation off site. The SEIS has been amended to reflect this change and included results of a survey of existing waste disposal facilities in the region and waste transport capabilities. It is expected that the 23 m^3 waste bin would need to be emptied weekly for a camp with up to 500 people.

In order to prevent adverse impacts on and off the site as a result of the management of waste on site, MMG proposed to build a hardstand area with a roof for all on site waste equipment. The new proposed solid waste management system described would not produce leachate. The SEIS reported that an established council owned and operated landfill facility in Cloncurry would be available to accept the general waste from the proposed mine accommodation camp. The Cloncurry landfill has an expected life and capacity adequate for the requirements of the proposed mine operation life and there is a well established transport industry in existence for the conveyance of general waste to the landfill.

DERM requested further information on how clinical waste and grease trap waste would be managed in accordance with the waste management hierarchy under section 10 of the Environmental Protection (Waste Management) Policy 2000 and that these recommendations must also be incorporated into the EM Plan for the project. In response the SEIS and EM Plan have been updated to contain information on the collection of clinical waste by a licensed contractor and disposal of this waste to an appropriate facility in accordance with the relevant DERM guideline "Managing clinical or related waste in scheduled areas". Grease trap waste would be also collected by a licensed regulated waste contractor and disposed of to an appropriate facility. An estimated 500 kg of clinical waste and 2,500 kg of grease trap waste per year would be generated by the Dugald River Project.

In the SEIS, MMG commits to managing regulated waste n accordance with the waste management hierarchy (i.e. avoidance, recycling, waste to energy and disposal) and consistent with the relevant legislation and policies.

MMG has committed to incorporating a program of best practice waste management including the ongoing assessment of cleaner production and waste management opportunities for the life of the project. The goal of waste management on site would be to reduce potential health and environmental hazards which may occur from waste generation and disposal.

Information was requested by DERM detailing how waste explosive boxes would be managed to prevent environmental harm as explosive box waste management requires additional management measures that are not employed in a general landfill. MMG plan to develop an appropriate area, with the advice of Queensland Fire and Rescue Service and licensed under the Explosives Regulation 1955, to allow for the burning of explosive boxes. Although explosive boxes would be cardboard, they cannot be removed from site for recycling or removed with general waste to the Cloncurry council landfill due to the potential explosive residues requiring additional management measures not employed in general landfill practices. This section of the SEIS has been amended with consideration to bushfire management strategies.

This assessment finds that the information provided in the EIS documents and the waste management processes outlined fulfil the requirements of the TOR.

4.10 Water resources

Water resources and management section described the EIS and EM Plan received numerous comments from DERM and other government agencies. The following subsections address water resource requirements in more detail.

4.10.1 Surface water

The EIS identified that the area is highly mineralised and as a result the chemical analysis of surface waters from the site showed the background concentration of antimony, arsenic, lead, silver and zinc well above the ANZECC Guidelines triggers. The proposed surface water management system proposed a number of diversion drains to divert clean runoff away from disturbed areas and containment storages to capture dirty and contaminated runoff on site. A long term water balance modelling investigated the behaviour of the storages proposed as part of the water management system (with the exception of the TSF) based on a 120 year period of simulation. The water balance modelling results indicated that the proposed water management system is robust and has adequate storage capacity for managing surface water runoff within the project site.

DERM made comments on the EIS and EM Plan regarding all aspects of surface water quality description, data collection, assessment of results, monitoring methodology, management of runoffs, contamination and flooding, surface water triggers and limits, water balance modelling and stream sediment monitoring. Management measures for cyanide were also requested, including monitoring programs and water quality limits for cyanide. Additional information on flooding was also sought in relation to dams and diversion structures, including mitigation measures in terms of erosion or overtopping of significant and high hazard dams, erosion or other matters for diversion drains in protecting drifts, and demonstration in the EIS that the location of dams and drains in concept designs are sustainable.

MMG addressed these concerns, including the removal of monitoring results from outside the project area and provided water quality monitoring data from studies conducted late 2010 and early 2011 in the SEIS. These studies also incorporated requested water quality indicators (iron, total dissolved solids and conductivity and sulfates). Rising stage samplers (RSS) and falling stage samplers (FSS) were also installed. Grab samples would be taken whenever possible to expand the dataset and RSS and FSS would be collected within 48 hours of being triggered, and when visiting. Sampling and quality assurance procedures would be undertaken in accordance with the Monitoring and Sampling Manual (DERM 2010).

As a result of the numerous comments the EIS received, the SEIS, the surface water quality and stream sediments report, the surface water assessment and the EM Plan were updated to include requested information and the following strategies were proposed to maintain the water quality of waterways on the project site:

- Clean stormwater would be separated from contaminated stormwater by the use of diversion bunds.
- Contaminated runoff from mining and processing areas would be contained in stormwater dams with a design storage allowance suitable for the level of contamination expected.

- Stormwater runoff from disturbed areas that contains suspended sediments would be drained via sediment dams with a capacity for a 1:10 year ARI, 24 hour event.
- Land disturbance within the streams and adjacent to their bank would be minimised and vegetative cover would be maintained wherever possible.
- The EMP outlines procedures to deal with spillage of fuel or other chemicals, which incorporates placement and maintenance of spill kits and prompt response and reporting of spills that occur.
- Monitoring of surface water quality would be conducted for all streams downstream of any mining or infrastructure related disturbances once project construction has commenced.
- Should the surface water monitoring program detect concentrations downstream of mining activities higher than the trigger or limit values in EA, then an investigation into the likely causes would be initiated. The results of the investigation and mitigation strategies, if necessary, would be reported to the DERM.

Details of monitoring of stream flow in streams that may receive a release of storm water has been included in the amended EM Plan. DERM considers that while the project area lies within a catchment administered under the Water Resource (Gulf) Plan 2007 (Gulf WRP), as there are only minor diversions of overland flow proposed and there is no direct take of surface water, no specific authorisations are required.

Parameters for end-of-pipe release and monitoring were also amended in the EM Plan of September 2011, and are consistent with surface water quality trigger levels and contaminant limits in the updated surface water quality and stream sediments report and SEIS.

However, despite DERM's request to update the trigger values of aluminium in combination with pH, the proponent did not considered aluminium to be an element of concern and hence excluded aluminium in the monitoring program. MMG argued that neither the waste rock characterisation nor the tailings characterisation studies identified aluminium as an element of concern.

The EIS identified the substrate of the rivers and streams within the project site as typically medium sand to coarse gravel. The area was highly mineralised and showed concentrations of arsenic, lead and zinc concentrations above the ANZECC Guidelines default triggers. DERM commented that the sediment quality criteria in the EIS were considered excessively high and not based on current guideline approaches and recommended that background sediment quality criteria for the site should be developed and stream sediment trigger values recalculated. As a result MMG amended the specialist report, the SEIS and the EM Plan to include the updated stream sediment trigger levels and contaminant limits. The following recommendations have also been proposed for the management of streams:

- Any land disturbance within streams beds and adjacent to their bank would be kept to a minimum and stabilised immediately on completion of works.
- Stormwater runoff from disturbed areas that contains suspended sediments would be drained via sediment dams with a capacity for a 1:10 Year ARI, 24 hour event.
- An annual stream sediment monitoring program would be conducted for all streams downstream of any mining or infrastructure related disturbances. The monitoring program would include an adequate number of upstream background sites so that natural variations in stream sediment quality would be monitored.
- Should the stream sediment monitoring program detect metal concentrations downstream of mining activities higher than the trigger values proposed in the EIS then an investigation into the likely causes would be initiated. The results of the investigation and mitigation strategies, if necessary, should be reported to the DERM.

Furthermore, MMG committed to implement monitoring programs to detect any adverse effects to wildlife, surface and groundwater quality due to the use of cyanide. The proposed monitoring programs for release points and receiving waters are detailed in the SEIS.

A flood study of the Dugald River and Silvermine Creek indicated that the mining operations and infrastructure would be located above the 100 year ARI flood levels along these waterways. The pipeline crossings are expected to have minimal impact on flood behaviour in the affected waterways as they would cross these creeks at levels above the 100 year ARI flood levels.

The supports holding the pipeline across the waterways would slightly reduce the waterway areas at these locations but would have minimal impact on the flooding behaviour of these waterways. Subsidence impacts on flooding behaviour and erosion along local waterways was found to be insignificant.

Although the main access road to the project site would be susceptible to flooding from the Dugald River the project site would not be susceptible to flooding from the Dugald River. However, parts of the site, access roads and the water pipeline route would be susceptible to flooding from tributaries of the Dugald River, such as the Silvermine Creek. All proposed waterway crossings would require erosion and scour protection on the upstream and downstream road embankments.

The existing Silvermine Creek gauging station was affected during major flow events in early 2011. As such it was recommended that the gauging station would be relocated to an appropriate site, at least 300 m upstream of its current position.

MMG proposed environmental protection commitments for receiving surface waters as required under the EP Act. For each identified environmental value the EM Plan proposes:

- an environmental protection objective
- appropriate control strategies
- EA condition(s) containing measurable standards and indicators.

Included in the EA conditions proposed for receiving surface waters would be trigger levels and contaminant limits for a range of physio-chemical and toxicant parameters designed to protect the environmental values downstream.

DERM also sought further information on environmental values and impacts downstream of the project area, including a map showing homesteads, townships as well as any other lawful takers of water downstream of the project site. These matters were adequately addressed in the SEIS and the EM Plan.

On site stormwater management storages are described in the SEIS. Of the seven storages, one is considered to the high hazard. However, DERM raised concerns that two other storages, one receiving runoff and seepage from the NAF Waste Rock Dump and another collecting runoff from the ROM stockpile, could result in the dams being considered high hazard dams necessitating redesign. In response, MMG outlined contingency measures that could be taken to ensure the dams met the required design criteria including enlarging the storage volume by increasing the depth and extending the pumping system to direct reuse of stored water in the processing plant to meet DSA requirements. This assessment considers that there contingencies are appropriate.

Concerns were also raised that the elements of the diversion drains and levees that would be installed as part of the stormwater drainage works would be difficult to construct. The proponent responded by stating that the dimensions and other aspects of the design of the stormwater drainage works were essentially concept design guidelines for the minimum acceptable drain sizes. Detailed designs will be prepared prior to construction. While the stormwater drainage works as described in the EIS documentation has sufficient capacity to meet design requirements, it is recommended that the final location and design of drainage works be submitted to DERM, particularly if any major change in the location of works is identified from the detailed design.

It is recommended that on site mining and processing area stormwater storages be regulated as described in Table 55 of the EM Plan. Further, it is recommended that in the absence of a sufficient data to set trigger limits for all likely contaminants in any discharges from the site, that the ANZEEC trigger limits, as described in the EM Plan be applied.

4.10.2 Groundwater

The groundwater in the vicinity of the project site was found to be alkaline and slightly brackish as a result of the influence of calc-silicate rocks and the arid environment in which the groundwater occurs. There is limited use of groundwater in the vicinity of the project for cattle watering. The EIS identified that the water table in the Dugald River Project area is naturally deep. Based on historical groundwater studies, observations during exploration drilling programs and monitoring of groundwater bores one primary aquifer (the Corella formation) and some secondary aquifers (the minor Dugald River Slate and the insignificant Knapdale Quartzite) were found in the Dugald River Project area. The only recharge to the prime aquifer in the Corella formation is through infiltration and deep percolation of rain water.

The recharge to the fractured rock aquifers is minimal and the depth of the incision is of the watercourses is shallow. The EIS concluded that natural groundwater discharge does not occur in the immediate vicinity of the project. No localised groundwater-surface water interactions were found. Groundwater was found to flow to the east and northeast of the project area towards the Dugald River.

The groundwater from the Corella formation was found to be of moderate good quality with very little sulfate while the groundwater from the Dugald River Slate was saline and sulfate rich due to the chemical equilibrium with the ore body.

DERM requested further information on how groundwater from de-watering of the mine would be managed in relation to the site water balance. In response additional groundwater bores were drilled to investigate the groundwater inflow to the ore body. Free groundwater was found in shallow depths of 24 to 46 m, based in the weathered zone. Standing water levels in the bores relatively close to the surface indicated that the groundwater in the Dugald River Slate is confined. No further groundwater was found below 46 m, despite drilling up to 108 m depth.

Based on this evidence the SEIS concluded that minor quantities of groundwater would be encountered during underground mining. The calculated volume of groundwater in the Dugald River Slate was estimated at 2.3 ML while the estimated volume of groundwater that would be needed to be removed was approximately 1.84 ML. This volume would be managed by small discharge production bores drilled at equal intervals along the strike of the ore body. Dewatering bores would need to be extended to the base of the weathered zone. The SEIS estimated that with simultaneously pumping bores dewatering of 1.84 ML groundwater can be achieved within 11 days of full time pumping. The SEIS concluded that the cone of depression caused by dewatering of the mine would not impact on privately owned groundwater facilities.

Groundwater from mine dewatering flows would be pumped into the process/evaporation dam following primary settling. A conceptual groundwater model for the underground mine indicated that the mine dewatering flows would be in the order of 0.05 ML/day. These flows were not previously discussed as part of the water balance reporting as the process water demands far exceed the estimated groundwater inflow rate, and it was assumed that all mine dewatering flows would be reused on site. This new estimate accounts for the possibility of additional mine dewatering requirements due to higher than expected Corella Formation aquifer yields.

While the project area lies within a catchment administered under the Water Resource (Gulf) Plan 2007 (Gulf WRP), this part of the Gulf WRP area lies outside of any groundwater management areas hence no authorisations or permits will be required.

Groundwater contamination could occur from unmanaged chemical spills or from infiltration of leachate directly from the ROM pad, waste rock dump(s) and water containment dams. Based on the rainfall-groundwater level relationships in the dedicated groundwater monitoring bore suite and the permeability tests on that suite of bores the aquifers beneath the interfluve, were both confined and of quite low permeability. Therefore this area was considered to have a low vulnerability to groundwater contamination. By contrast the aquifers within about 50 m of Silvermine Creek and its Tributary A to the north were considered in the SEIS as more permeable and relatively quickly recharged by rainfall. These corridors would be more vulnerable to groundwater contamination. The SEIS concluded that the only potential discharge of dirty or contaminated water from the project site to the receiving environment is via discharge from the proposed stormwater storages. Based on water balance modelling results spill events from the low hazard and sediment ponds would be most likely to correspond to significant flow events in the waterways draining the site.

Seepage from tailings in the proposed TSF was further investigated and reported on the SEIS in response to comments on the EIS. Only minor groundwater supplies were found in the deeper bores within the Knapdale Quartzite in the TSF area and the permeability of the Knapdale Quartzite beneath the proposed TSF was found to be low. These low intrinsic permeability values indicated it was unlikely there would be any deep percolation of seepage in the proposed TSF. Hence, the EIS and SEIS concluded that there is a low risk of contamination of the hydrogeological regime (including surface water) from seepage from the TSF due to the intrinsically low permeability of the underlying strata and the very low permeability that would be achieved by the beaching and subsequent evaporation from tailings deposited in the TSF.

In comments on the draft groundwater monitoring program proposed by MMG, DERM requested that major cations and anions, total aluminium and total dissolved solids should be included in all groundwater monitoring programs. MMG amended the list of parameters to include chloride and bromide. However, MMG deemed the inclusion of total aluminium and total dissolved solids as unnecessary as aluminium was not considered to be an element of concern during EIS studies.

To minimise impacts on groundwater resources, the SEIS proposed the following strategies:

- Chemical storage and handling areas would be bunded to contain accidental spills.
- Bulk petroleum products would be loaded and unloaded a designated area, which would include appropriate spillage management features in its design.
- A network of groundwater monitoring bores has been installed and these would be monitored on a regular basis.
- Minimal use of groundwater where practicable.
- No infrastructure that can cause groundwater contamination, would be constructed, or limited to only that which is absolutely necessary, in a corridor that extends 50 m either side of Silvermine Creek and Tributary A.
- If there is any possibility of leachate runoff to these creeks, bund walls would be installed to divert flow to holding storage ponds for pumping back as processing water.
- Surface runoff management ponds that contain waters classified as potentially contaminated (either toxic, or sub-lethal) would be lined with a high density polyethylene liner.

Monitoring points have been established so that future monitoring can be compared with this baseline to determine if any impact or contamination of groundwater may be occurring.

This assessment concludes that the EIS documentation has shown that the potential impacts of the project on groundwater resources is limited and that those impacts which may occur can be appropriately managed.

4.11 Air quality

The main air borne wastes emitted from the project would be:

- Particulate matter with equivalent aerodynamic diameters of 10 μm or less (PM_{10})
- Particulate matter with equivalent aerodynamic diameters of 2.5 μm or less ($PM_{2.5}$)
- Carbon monoxide
- Nitrogen dioxide
- Total suspended particulate matter (TSP)
- Greenhouse gases.

The predicted ground-level concentrations of $PM_{2.5}$, PM_{10}, carbon monoxide and nitrogen dioxide for the construction phase were described in the EIS and SEIS. The modelling results indicated that all ground-level concentrations would be well below the EPP (Air) objectives. Whilst background concentrations have not been included, the ground-level concentrations are so low that even if a background was included the concentrations would still be well below the relevant air quality goals.

The EIS addressed the air quality matters raised in the TOR, including dust and greenhouse gas emissions. DERM, in comments on the EIS, sought clarification on a number of matters including nuisance dust deposition reporting, annual deposition, dust emissions estimation from the TSF, 24-hour average PM_{10} concentrations and best practice environmental management. DTMR commented that insufficient detail has been provided on the type of load covers that would be used on the quad road trains given the haulage loads would include lead concentrates. These comments have been addressed in the relevant sections of the SEIS, and summarised below.

The nearest residence to the mine, the Roseby Homestead, would be located 6 km south-southeast of the processing plant. Moderate to strong north-north-westerly winds would be required for dust emissions from the mine to impact this residence. Overall, winds from the north-north-westerly sector (from 300° to 360°) are likely to occur for less than 5.2 % of the time and these winds are predominantly light to moderate.

Emission rates of metals (lead, arsenic, cadmium, manganese and nickel) were calculated from the proportions of each metal present in the waste rock, ore, tailings dam and lead and zinc concentrates. The most significant sources of dust would be from the stockpiles and trucks hauling ore and waste rock. An induced-draft dust collector would be used to minimise airborne dust from the ROM stockpile and during crushing. Water sprays would be used at the ROM bin, primary crusher and transfer chutes to prevent fines from becoming airborne. Dust emissions due to wind erosion from the dry beach area of the tailings dam were estimated on a conservative scenario, taking into account the maximum dry beach area on the final year of operation. The dry beach area is assumed to be located close to the tailings discharge points.

In the EIS the proponent outlines a number of measures to ensure dust from the haulage of concentrate are minimised. The loads of all trucks carrying concentrate or bulk material from the site would be covered. Concentrate haulage would be handled by 105 t capacity quad road trains, which would be covered with hydraulically articulated hard covers to prevent loss of concentrate and dust emissions.

The results of modelling reported in the EIS indicated the EPP (Air) objectives could be met for predicted 24-hour and annual average ground-level concentrations of $PM_{2.5}$, annual average ground-level concentrations of TSP and annual average dust deposition rates at the nearest homestead residence and at the Roseby Accommodation Camp due to the combined operations at the Dugald River Project, the adjacent Roseby Copper Project and ambient background levels.

Modelling of dust emissions at the Roseby Copper project, independent of the Dugald River project have indicated that the EPP(Air) objective for 24-hour average ground-level concentrations of PM_{10} was predicted to be exceeded at the nearest homestead residence in the later years of the Roseby Copper Project when operations would be closer to the homestead. However, levels at the Roseby Accommodation Camp were predicted to comply with the EPP(Air) objective.

Predicted annual average ground-level concentrations of lead, arsenic, cadmium, manganese and nickel due to the Dugald River Project as an increment were well below the EPP(Air) objectives at the nearest homestead residence and the Roseby Accommodation Camp. Concentrations at these sites would be unlikely to exceed the EPP(Air) objectives even with inclusion of a background level.

Predicted concentrations of 24-hour average PM_{10}, 8-hour average carbon monoxide and annual average nitrogen dioxide from the gensets operating in isolation was predicted to be less than 1 % of the EPP(Air) objectives at the nearest homestead. Predicted maximum 1-hour average ground-level concentrations of nitrogen dioxide were well below the EPP(Air) objectives and would be unlikely to exceed the objectives with the inclusion of background levels.

The greenhouse gas emissions have been calculated for the ultimate mining capacity of 2 Mt/y of lead/zinc/silver ore and 1 Mt/y of copper ore with four generator sets producing a total output of 4.5 MVA. The generator sets would power the mine operations as well as the on site accommodation facilities for workers for the first two years of operations. Electricity would be sourced from the grid once the power line had been commissioned. The peak annual emission rate of greenhouse gases due to the Dugald River Project is expected to be 236,288 t carbon dioxide (CO_2-e) per year. This represents 0.04% of Australia's assigned amount of emissions per annum under the Kyoto Protocol.

DERM requested further information on who would undertake regular energy audits under the Greenhouse Gas Management Plan. MMG responded that energy audits would be conducted every 5 years by an independent auditor and that the SEIS and the Greenhouse Gas Management Plan have been updated to reflect this information.

DTMR has advised that it considers that it requires additional details on the dust mitigation and management measures that will be applied to the loading, transport and unloading of concentrate. Assurance is needed that appropriate measures will be adopted to ensure mineral concentrate dust is appropriately managed during the road transport of mineral concentrates to the preferred rail loading facility.

It is recommended that the project proponent provide the information requested by DTMR prior to operation of the mine.

It is recommended that the standard air emission limits (based on the EPP(Air) be applied to the project.

4.12 Noise and vibration

The EIS adequately described the existing environment values that may be affected by noise and vibration from the Dugald River Project.

Prior to the consideration of the EIS for the Dugald River Project, DERM had set draft specified noise limits for the adjoining Roseby Copper Project, specifically aimed at achieving an acceptable level of impact at the Roseby Homestead, the nearest sensitive receptor. As the Roseby Homestead would also be affected by the Dugald River project, the proposed noise criteria for this project would need to take into account those proposed for the Roseby Copper Project.

The EIS identified that the background noise environment in which the project is located is typical of rural regions of Australia, exhibiting relatively low minimum background noise levels during daytime, evening and night periods.

The nearest sensitive receiver to the project is the Roseby Homestead, located approximately 6 km from the processing plant in a south-easterly direction. Due to separation distances, this is the only neighbouring residence that may potentially be impacted by noise from:

- Light and heavy vehicles on the project site and accessing the project site
- Hauling and dumping operations
- Crushing
- Ore processing.

Noise levels from the mine operations were predicted at the nearest noise sensitive receptors for different meteorological conditions. The noise levels at the Roseby Homestead were assessed against numerous DERM noise criteria with the combined operation of the Dugald River and Roseby Copper projects with the following results:

  - DERM's proposed draft criteria for the Roseby Copper project were predicted to be readily achieved due to the 6 km separation distance. As the predicted noise levels are well below the criteria, it is considered likely that the cumulative impact of this project and the adjoining Roseby Copper Project would also comply with the criteria.
  - Appropriate noise levels generated through DERM's Planning for Noise Control Guideline 2004) levels were predicted to be met in the day, but exceedences are predicted to occur in the evening and night (3 decibel A (dB(A)) exceedance). This exceedence could be ameliorated with noise control measures or through liaison between this project and the Roseby Copper Project.
  - DERM's sleep disturbance and annoyance criteria were predicted to be met.
  - DERM's low frequency noise criteria were predicted to be met.
  - DERM's blasting criteria were also predicted to be met due to the 6 km separation distance to the nearest receiver.

In terms of the combined impact from this project and the adjoining Roseby Copper Project, the combined noise level was predicted to achieve the DERM proposed noise limits for the Roseby Copper Project. Overall, the DERM's criteria proposed for the Roseby Homestead were predicted to be readily achieved by the Dugald River Project with the proposed mining operations. Other non-project specific DERM criteria would be exceeded on occasions.

The SEIS stated that compliance with noise and vibration requirements for the Dugald River Project would be managed by:

- Ensuring that mufflers fitted to mobile equipment are properly maintained.
- Undertaking continuous noise monitoring at the Mount Roseby Homestead during construction and operations to determine compliance with the project noise criteria.
- Maintaining a complaints register during all phases of the project and investigating all noise related complaints.

Notwithstanding these commitments, it is expected that the proponent will undertake to use all practical measures to maintain an acceptable level of noise amenity at the Roseby Homestead and at any other noise sensitive locations that may be impacted by the mining activity. Also, that should any concerns be raised about the noise and vibration at affected sites, that the proponent uses the monitoring information and subsequent analysis and investigation to, if necessary, respond by changing work practices on the mine site or undertaking additional mitigation measures. This requirement should be included in the environmental conditions for the project.

The recommended conditions for the management of noise impacts take into account those proposed conditions for the Roseby Copper Project and do not result in any deterioration of amenity at the Roseby Homestead beyond what is provided for in those conditions.

4.13 Ecology

The EIS described the existing nature conservation of the proposal area and how these values may be affected by the proposed activity (including the proposed project site, the proposed powerline and water pipeline corridors and the access route). While several ecology surveys were undertaken for the EIS, DERM made a number of comments on the description of the existing nature conservation presented in the EIS. Comments were provided on the need for additional field surveys to collect data during the wet season, to update bat, reptile and amphibian sampling and to confirm the potential occurrence of the purple-necked rock-wallaby on the project site, especially on the Knapdale Ranges and the vicinity of the proposed TSF. The purple-necked rock-wallaby is listed as vulnerable under the *Nature Conservation Act 1992* and warrants special consideration in terms of mitigation of possible impacts. Recommendations by DERM also included updating information on existing vegetation communities (Regional Ecosystems; REs) and quantifying and confirming the total amount of vegetation clearing that would occur on site. Another important point was made regarding the ecological impacts, both aquatic and terrestrial, due to the construction of the proposed TSF. Comments provided included the need to update fauna habitat requirements for some species and plant names and that more details on likely impacts and proposed mitigation measures are described.

In response, the SEIS reported that additional terrestrial and aquatic ecology surveys were carried out and the SEIS and EM Plan were updated to include the new results and requested information. These are discussed in more detail below.

4.13.1 Terrestrial flora and fauna in the project site

Eight vegetation communities were found on the project site during surveys. All communities are classed as remnant vegetation under the *Vegetation Management Act 1999* (VM Act), all of which are listed as least concern under the VM Act. No listed threatened ecological communities under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) were found. The EIS noted that it was likely that the original vegetation communities within the Dugald River Project area have been modified as a consequence of land management activities including grazing, changed fire regimes and weed invasion, in particularly alteration of groundcover by the now dominant Buffel Grass (*Pennisetum ciliare*).

A total of 222 flora species were identified, none of which are listed as threatened under the *Nature Conservation Act 1992* (NC Act) or EPBC Act. Seventeen flora species are introduced species with six of these being identified as a Class 2 pest species under Queensland's *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) and five of these being classified as Weeds of National Significance (WONS) by the Australian Government.

A combined total of 113 vertebrate fauna species were found during fauna surveys, comprising 16 reptiles, 65 birds, 26 mammals and six amphibians. Three of the bird species, listed as migratory and/or marine under the EPBC Act, were observed on the project site. Four introduced species were identified on the project site including the House Mouse (*Mus musculus*), Feral Cat (*Felis catus*), Feral Pig (*Sus scrofa*) and Dingo (*Canis familiaris dingo*), the latter three of which are declared as Class 2 pests under the LP Act.

The EIS identified the following potential impacts on nature conservation values on the project site.

- Approximately 192.9 ha of remnant vegetation would be cleared (Table 4.3), including clearing of the following vegetation of conservation significance:

  - 16.7 ha of River Red Gum Riparian Woodland in the proposed TSF (RE 1.3.7b, listed as endangered under DERM's biodiversity status)
  - 23.6 ha of Silver Box/Cloncurry Box Open Woodland (RE 1.5.4x3, listed as of concern under DERM's biodiversity status).
- Possible impacts on the Whistling Kite (*Haliastur sphenurus*), Rainbow Bee-eater (*Merops ornatus*) and Sacred Kingfisher (*Todiramphus sanctus)* (all listed as listed as migratory and/or marine under the EPBC Act). The SEIS concluded that the distribution of these three listed species is widespread throughout northern and eastern Australia, and the local populations on the project site are unlikely to constitute an ecologically significant proportion of the total population of these species. Furthermore, the project site is not at the limit of these species' range, nor are these species considered to be declining within the region. Therefore, it is unlikely the project would have a significant impact on the regional populations of these species.
- Impacts on the Purple-necked Rock-wallaby (*Petrogale purpureicollis*) were identified along the lower faces of the Knapdale Range within REs 1.11.2a and 1.3.7b. This species is listed as vulnerable under the NC Act.

Table 4.3 Regional Ecosystems to be cleared in the project site

Regional Ecosystem	Total area on project Site (ha)	Area to be cleared (ha)	VMA class[1]	Biodiversity status[2]
Snappy Gum Open Woodland on steep hills and strike ridges (RE 1.11.2a)	1,186	97.7	Least concern	No concern at present
Snappy Gum Open Woodland on foothills (RE 1.11.2e)	555.5	30.4	Least concern	No concern at present
Cloncurry Box Open Woodland on low broad hills (RE 1.11.3a)	365.5	0	Least concern	No concern at present
Cloncurry Box Open Woodland on hills (RE 1.11.3x1)	331.6	24.5	Least concern	No concern at present
Mixed Bloodwood Riparian Woodland (RE 1.3.6a)[3]	11.2	0	Least concern	Of Concern
River Red Gum Riparian Woodland (RE 1.3.7b)	98.4	16.7	Least concern	Endangered
Gidgee Open Woodland (RE 1.3.4)	97.12	0	Least concern	No concern at present
Silver Box/ Cloncurry Box Open Woodland on red earths (RE 1.5.4x3)	155.1	23.6	Least concern	Of Concern
Total (ha)	2800.42	192.9		

[1]VMA Class - Conservation status under the VM Act.

[2]Biodiversity status - Conservation status under DERM's Regional Ecosystem Description Database.

[3]The RE of the Mixed Bloodwood Riparian Woodland was incorrectly identified in the EIS and SEIS as RE 1.3.6b instead of RE 1.3.6a.

4.13.2 Terrestrial flora and fauna - power line corridor

MMG proposes to construct a powerline from the project site to Chumvale Substation, which would be located approximately 10 km west of Cloncurry on the Barkly Highway. The powerline corridor would be approximately 60 km in length and a width of 400 m was surveyed along the corridor.

Six vegetation communities were found along the powerline corridor during surveys. All communities but one were classed as remnant vegetation and are listed as of least concern under the VM Act (Table 4.4). No listed threatened ecological communities under the EPBC Act were found. Seven River Red Gum Riparian Woodland (RE 1.3.7.a/b) creek crossings were identified within this powerline corridor. The River Red Gum riparian community is listed as endangered and the Mixed Bloodwood Riparian Woodland is listed as of concern biodiversity status.

Several introduced flora species were identified within the powerline corridor. Although no species are listed under the LP Act, many of these species establish rapidly and out-compete existing native plants (e.g. the Mimosa Bush, *Acacia farnesiana*). None of these species are listed as Weeds of National Significance (WONS).

Six rocky outcrops that could potentially provide Purple-necked Rock-wallaby habitat were identified within the powerline corridor. The Purple-necked Rock-wallaby was observed at two rocky outcrops and potential habitat and/or foraging sites were observed at most other rocky outcrop locations.

The EIS identified the following potential impacts on nature conservation values on the project site:

- Approximately 492 ha of remnant vegetation would be cleared (Table 4.4), including clearing of the following vegetation of conservation significance:
  - Clearing of 23 ha of River Red Gum riparian community (RE 1.3.7b, listed as endangered under DERM's biodiversity status)
  - Clearing of 12 ha of Mixed Bloodwood Riparian Woodland (RE 1.3.6a, listed as of concern under DERM's biodiversity status)
- Impacts on rocky outcrops containing Purple-necked Rock-wallaby habitat during construction of the powerline.

The River Red Gum Riparian Woodland (RE 1.3.7) was considered as the most diverse within the local area of the project site and helped maintain the environmental integrity of watercourses in the region. This riparian community is generally considered as valuable to the local fauna as it provided shelter around water holes as well as nesting holes within tree hollows. This community provided a shady and productive ecosystem for fauna in comparison to the arid, more inhospitable communities surrounding the area. Floristically, it was the most diverse community. In general it is known that the root system of the River Red Gum (*Eucalyptus camaldulensis*) helps stabilise the banks of a watercourse and prevents erosion during flooding events.

Purple-necked Rock-wallabies are known to inhabit suitable rocky outcrops in North-west Queensland, particularly in the Cloncurry region, and are known to regularly travel short distances, with animals often required to travel to neighbouring mobs for reproductive purposes. Sightings were made at two of the six rocky outcrops within the corridor survey area which was 200m wide.

Table 4.4 Regional Ecosystems to be cleared along the powerline corridor

Regional Ecosystem	Area to be cleared (ha)[1]	VMA class	Biodiversity status
Snappy Gum Open Woodland (RE 1.11.2a)	54	Least Concern	No Concern at Present
Cloncurry Box Open Woodland (RE 1.11.3x1)	328	Least Concern	No Concern at Present
River Red Gum Riparian Woodland (RE 1.3.7a/b)	23	Least Concern	Endangered
Gidgee Open Woodland (RE 1.11.2x2)	75	Least Concern	No Concern at Present
Mixed Bloodwood Riparian Woodland (RE 1.3.6a)	12	Least Concern	Of Concern
Non-remnant Grassland	15	Not Listed	Not Listed
Total (ha)	507		

[1]Based on a corridor length of 60 km and a width of 80 m.

4.13.3 Terrestrial flora and fauna along the water pipeline corridor

The water pipeline route would commence at the T-intersection of the Ernest Henry/Lake Julius Pipeline and travels south and then west to the proposed process plant area within project site. The corridor would be approximately 10 km long and a corridor width of 40 m was surveyed.

Four vegetation communities were found along the water pipeline corridor during surveys. All communities were classed as remnant vegetation and listed as least concern under the VM Act (Table 4.5). No listed threatened ecological communities under the EPBC Act were found. The Mixed Bloodwood Riparian Woodland is listed as of concern under DERM's biodiversity status.

The EIS identified the following potential impacts on nature conservation values on the project site:

- An unspecified amount of remnant vegetation would be cleared (Table 4.5), including clearing of the following vegetation of conservation significance:
  - Clearing of 0.2 ha of the Mixed Bloodwood Riparian Woodland (RE 1.3.6a, listed as of concern under the biodiversity status
- Impacts on one rocky outcrops containing Purple-necked Rock-wallaby habitat during construction of the pipeline corridor.

Based on proposed disturbance plans for the project, clearing would be required within all vegetation communities. However, MMG did not specify the total amount to be cleared as part of the construction of the water pipeline corridor.

Table 4.5 Regional Ecosystems to be cleared along the water pipeline corridor

Regional Ecosystem	Area to be cleared (ha)[1]	VMA class	Biodiversity status
Snappy Gum Open Woodland (RE 1.11.2a)	Not specified	Least Concern	No Concern at Present
Cloncurry Box Open Woodland (RE 1.11.3x1)	Not specified	Least Concern	No Concern at Present
Snappy Gum / Cloncurry Box Open Woodland (RE 1.11.2e)	Not specified	Least Concern	No Concern at Present
Mixed Bloodwood Riparian Woodland (RE 1.3.6a)	0.2	Least Concern	Of Concern
Total (ha)	Not specified		

[1]Based on a corridor length of 10 km and a width of 40 m.

4.13.4 Terrestrial flora and fauna along the access route

The access route corridor is approximately 10 km long and follows along an existing track for the majority of the length. An alternate access road and a temporary access road deviation were also surveyed. A 50 metre corridor was surveyed along all proposed access routes and deviations.

Five vegetation communities were found along the access route options. All communities are classed as remnant vegetation and listed as least concern under the VM Act (Table 4.6). No listed threatened ecological communities under the EPBC Act were found. The River Red Gum riparian community is listed as endangered and the Mixed Bloodwood Riparian Woodland is listed as of concern under DERM's biodiversity status.

The EIS identified the following potential impacts on nature conservation values on the project site:

- Approximately 11.86 ha of remnant vegetation would be cleared (Table 4.6), including clearing of the following vegetation of conservation significance:
  - Clearing of 0.16 ha of Mixed Bloodwood Riparian Woodland (RE 1.3.6a, listed as of concern under DERM's biodiversity status)

Based on proposed disturbance plans for the project, current access track disturbance, and a proposed access road clearance width of 8 m, no additional clearing would be necessary within the River Red Gum Riparian Woodland (RE 1.3.7a/b, listed endangered under the biodiversity status).

Three major River Red Gum Riparian Woodland creek crossings exist within the access route corridor. Four minor creek crossings are present along the alternate access road and temporary access road deviation.

Table 4.6 Regional Ecosystems to be cleared along the access route

Regional Ecosystem	Area to be cleared (ha)[1]	VMA class	Biodiversity status
Snappy Gum Open Woodland (RE 1.11.2e)	7.2	Least Concern	No Concern at Present
Cloncurry Box Open Woodland (RE 1.11.3x1)	3.2	Least Concern	No Concern at Present
River Red Gum Riparian Woodland (RE1.3.7a/b)	No clearing required	Least Concern	Endangered
Gidgee Open Woodland (RE1.11.2x2)	1.3	Least Concern	No Concern at Present
Mixed Bloodwood Riparian Woodland (RE 1.3.6a)	0.16	Least Concern	Of Concern
Total (ha)	11.86		

[1]Based on a corridor length of 10 km and a width of 50 m.

4.13.5 Aquatic ecology

There are no major watercourses on the project site; however, there are several minor, ephemeral tributaries which run through the project area. Ephemeral watercourses on the eastern side of the site drain in an easterly direction to the Dugald River. On the western side, ephemeral creeks drain into Cabbage Tree Creek, which is a tributary of the Leichhardt River. Corella Creek is located south of the project site, which traverses the proposed powerline corridor. The Dugald River runs adjacent to the project site and is a tributary of the Flinders River which flows 450 km north into the Gulf of Carpentaria. Water use downstream of the site primarily consists of stock watering. The topography of the project site is undulating with a dominant ridgeline (the Knapdale Range) running through the central portion of site in a north-south direction.

In response to comments by DERM on the aquatic ecology in the EIS a full aquatic survey was conducted after a very wet summer season, in March 2011. A total of 22 aquatic sites were assessed to determine the overall condition of the available aquatic ecosystems within the project site. Water samples were taken where surface water was present. Macro-invertebrate sampling of water bodies was also undertaken, and Stream Invertebrate Grade Number-Average Level bi-plots were constructed to measure stream health. Vertebrate assemblage was assessed with trapping, spotlighting, and drag netting, as well as incidental fauna observations. Habitat, vegetation and stream morphology were also noted.

The ephemeral watercourses on the project site were found to be typical of ephemeral creek systems within the broader region, with no permanent water bodies. Creeks flow periodically during the wet season (November to April) particularly after heavy rainfall events.

Overall, the classification of the aquatic habitat within the project site watercourses ranged from good to favourable condition. Generally, the larger watercourses scored higher than smaller watercourses. Baseline water quality measures within and surrounding the project site showed that water quality measures exceeded trigger values at one or more sites for pH, aluminium, chromium, copper, lead and zinc. However, these results did not exceed proposed trigger values provided for livestock drinking water guidelines for cattle. A total of 26 macro-invertebrate taxa were identified during the survey. The habitat quality for macro-invertebrates in ephemeral creeks varied across the project site. No studies have been undertaken to look at the possible effects of any interference with waterway flows or impacts on aquatic fauna through proposed waterway barrier works.

A total of six amphibian species (one introduced), nine birds (three of which are listed under the EPBC Act as migratory and/or marine), one mammal (feral pig, introduced), no reptiles, and seven fish species were identified during the surveys. Another EPBC listed marine bird species, the Whistling Kite, was recorded during the terrestrial ecology surveys. Feral Pigs, listed as a Class 2 pest under the LP Act, were identified within riparian habitat.

River Red Gum riparian community (RE 1.3.7b, listed as endangered under DERM's biodiversity status) and Mixed Bloodwood Riparian Woodland (RE 1.3.6a, listed as of concern under DERM's biodiversity status) were both recorded from watercourses within the project site. No plants species listed under either the NC Act or EPBC Act were identified during the course of the survey. While 14 introduced plant species were recorded, none of these were classified as WONS.

4.13.6 Mitigation strategies for nature conservation

In the EIS documents, the proponent has indicated where decisions were made to avoid, where possible, impacts on terrestrial and aquatic flora and fauna.

In addition, MMG has committed to investigate opportunities for mitigation measures included ongoing opportunities to further avoid impacts at a local scale through the detailed design process, designing infrastructure to avoid disconnection in the water flow regimes, erosion and sediment controls, vegetation clearing procedures, rehabilitation, recontouring of landforms and other measures.

Mitigation strategies outlined in the SEIS included General Mitigation Strategies, Threatened Species Management Strategies, Powerline Construction Management Strategies, Weed Management Strategies, as well as Management Strategies for Introduced Fauna Species. The River Red Gum riparian community would be managed using relevant strategies suggested under the Queensland Government Environmental Offsets Policy 2008, with considerations for riverine wetland habitat.

The proposed development of the TSF may impact on the purple-necked rock-wallaby population present at the site. The construction of the proposed project may have both detrimental as well as positive impacts on the local rock-wallaby population. The EIS proposed a Threatened Species Management Strategy to manage and mitigate for impacts which may affect Purple-necked Rock-wallaby populations. This strategy includes creating a vertebrate pest control program, regulate roadways, enclosing the TSF area with metal fencing to exclude access for the Purple-necked Rock-wallaby and further research and monitoring. In order to minimise impacts on the Purple-necked Rock-wallaby along the powerlines MMG proposes avoiding any ground disturbance near rocky outcrops by at least 150 m.

The SEIS also concluded that Dugald River Project has the potential to negatively impact on aquatic ecosystems both directly and indirectly. The project would impact on catchments and in some places the beds of several watercourses on the project site. Infrastructure such as the TSF, PWD and process plant area would impact mainly on first order watercourses of North Creek, Silvermine Creek and the unnamed tributary traversing the TSF and the Dugald River. Wherever possible, infrastructure would be located as to avoid secondary impacts along higher order watercourses. The EIS noted the impacts would occur through:

- removal and alteration of aquatic habitat
- sediment loading
- excessive erosion and deposition
- contaminant loading
- biodiversity changes
- TSF impacts following rehabilitation.

The SEIS proposed a range of mitigation measures to reduce these negative impacts on aquatic ecosystems including:

- water quality, sediment quality and aquatic fauna monitoring program
- restoration of in-stream woody habitat (snags) and the improvement of fish passage over roadways
- habitat clearing procedures
- appropriate erosion and sediment control
- general aquatic flora and fauna management strategies
- management of pest flora and fauna, including weed management strategies and pest fauna management strategies in riparian areas.

Primary Industries and Fisheries at DEEDI acknowledged that project is exempt from approvals under the *Fisheries Act 1994* for waterway barrier works under *Sustainable Planning Act 2009* but recommended that culverts or bed level crossings that constitute waterway barrier works should be self assessed through the code Minor Waterway Barrier Works (DEEDI, Sept 2010) in order to minimise any interference with waterway flows or impacts on aquatic fauna that any necessary. While any possible interference has not been addressed in the aquatic ecology report, the SEIS and the EM Plan were updated to include this recommendation.

4.14 Cultural heritage

The EIS described the existing cultural heritage values that may be affected by the proposed project. This included environmental values of the cultural landscapes in terms of the physical and cultural integrity of the landforms. The EIS has adequately addressed both the Indigenous cultural heritage and non-Indigenous cultural heritage matters as required by TOR.

4.14.1 Indigenous cultural heritage

The project site is located in the Kalkadoon #4 People's Native Title claim area. Part of the southern section of the powerline is in the Mitakoodi and Mayi People's Native Title claim area. Cultural Heritage Management Plans (CHMP) were put in place with two Traditional-Owner groups, the Kalkadoon People and the Mitakoodi and Mayi People. The CHMP clearly defined how the project would be managed to avoid harm to Indigenous cultural heritage and if harm cannot be reasonably avoided, to minimise harm to Aboriginal cultural heritage. The CHMPs developed by MMG and the relevant Aboriginal parties comply with the statutory processes contained in Part 7 of the *Aboriginal Cultural Heritage Act 2003*. Each party had agreed to management actions in relation to land use activities to be undertaken on the project site and along the powerline corridor.

Several cultural clearance surveys were undertaken in the project area by Pasminco and the Kalkadoon people before the mining tenements were acquired by MMG. More recently, MMG and the Kalkadoon people conducted surveys in the project area to provide cultural clearance for exploration activities and the construction of the exploration camp. The surveys covered an area of 4.22 km^2 and were conducted in May 2007, August 2007, March 2008 and October 2008. Results of these surveys are confidential and therefore were not being presented in the EIS.

MMG intends to engage the Kalkadoon people to conduct further cultural heritage surveys to clear all areas required for the mining activities of the Dugald River Project. The surveys would be conducted in accordance with the CHMPs ahead of any disturbance in the project area.

4.14.2 Non-Indigenous cultural heritage

A Non-Indigenous cultural heritage assessment was undertaken of the Dugald River Project site. The EIS identified 19 historic sites located within the project area. A further 25 historic sites were located within the power, access and water pipeline corridors. However, none of these contained sufficient levels of cultural heritage of significance to warrant nomination to the Queensland Heritage Register.

The EIS identified that three historic sites would be directly impacted by the project. However, the EIS considered these sites to be of low significance and therefore no mitigation strategy would be required in relation to their disturbance and/or destruction. All sites and places identified would be either directly or indirectly impacted by the proposed project over the life of the mine and it would be possible that further historic sites may be located during future mining activities. Hence, the following strategies to manage the potential impacts of the project on historic cultural heritage have been proposed:

- The sites would be recorded in detail by a qualified cultural heritage professional and diagnostic material would be collected from these sites.
- Analysis and contextual research would be conducted on this material in order to add to the information available regarding small mines and miners in Queensland, such as dates for workings and dietary habits. These diagnostic materials then would be lodged as an appropriately accessioned collection with a suitable organisation, such as the Mary Kathleen Park Museum, at completion of analysis.

- Provision of a written report on the results of this analysis to MMG, the organisation with whom the material is lodged, and the John Oxley library.
- The alternate access road would be designed in such a way as to incorporate the railway embankment rather than cut through it.

4.15 Social

The EIS assessed the potential impacts on the lifestyle, wealth, safety, health and wellbeing of the community surrounding the Dugald River Project. Baseline data in the EIS was sourced from desktop studies, statistical and demographic reports as well as stakeholder engagement.

The Dugald River Project site is surrounded by pastoral properties. The closest homestead is the Roseby Homestead, which lies two and a half km to the south-east of the project boundary. Other pastoral properties exist in the vicinity of the project, with some owned/partially owned/operated by the owners of Roseby. The project lies within the Cloncurry Local Government Area, which covers an area of approximately 48,000 km^2 and encompasses the regional centre of Cloncurry as well as the smaller rural communities of Dajarra, Duchess, Kajabbi and Quamby. At the last census (2006) the Cloncurry Local Government Area had a population of 3,138 usual residents, including 706 Indigenous people. The most common family type was couples with no children, and the percentage of Cloncurry residents in the labour force was higher than the State average. Cloncurry also had fewer young people who require assistance but slightly more people of the age of 55 requiring assistance than throughout Queensland. The main employment in the region is associated with agriculture, mining and mining-related industries.

The EIS concluded that the Dugald River Project would have the potential to impact both positively and negatively on the local region. Key project related impacts identified include:

- Regional economic development
- Cumulative impacts
- Pressure on social amenity, community values, lifestyle, recreation and culture
- Psychological impacts (especially on landholders)
- Pressure on health and emergency services
- Impact on social order
- Pressure on highways, roads and public transport
- Opportunities for local business and enterprise (including procurement)
- Opportunities for local training and employment
- Impact on land value and security
- Land use and compensation
- Impact on short-term accommodation (including motels)
- Impact of workforce accommodation
- Cultural heritage management
- General environmental impacts, such as weed management
- Specific environmental impacts, such as noise and vibration, dust, lighting and visual amenity
- Mine closure.

A number of specific comments from government agencies were received regarding the social impact assessment of the project. These, together with MMG's response, are outlined in detail below.

The Department of Communities (DOC) commented that with regard to the information provided in the EIS that the use of place of enumeration of the 2006 Census as a basis of demographic study is less than optimal, as 22% of the Census respondents in Cloncurry Shire were away from home on the Census night. Most of these non-residents would most likely be workers in the mining industry. Furthermore, DOC outlined that most non-residents would most likely be adult workers, hence changing the age structure and employment levels in the Shire. The

demographic profile would need to provide information on the numbers and any other available information on people with disability living in Cloncurry Shire. Further comments included analysing impacts on the housing market and human services in Townsville as the main source community for employees.

The Social Impact Assessment Unit at DEEDI commented that the Social Impact Management Plan (SIMP) proposed in the EIS should ensure that all stakeholders are aware of the commitments, that agreement with them has been reached about how mitigation strategies would be progressed, and that this agreement is reflected in the community engagement component of the draft SIMP. DEEDI considered that the proponent would need to demonstrate in the community engagement plan for the project that an agreement has been reached or outline clearly the steps and timelines involved in achieving future agreement. Furthermore, the employee behavioural code/codes of conduct must include contractors, together with a commitment to allocating an identified number of positions for local Indigenous people consistent with *Commonwealth-State Closing the Gap* employment initiatives. While MMG outlined that the SIMP would be overseen by the project's community liaison officer, DEEDI commented that it would be good practice for the project's community consultative group (CCG) to be the key provider of advice on the effectiveness, implementation and success of the SIMP. This advice can then be forwarded to the Community Liaison Officer to meet review and reporting requirements. A Terms of Reference, proposed membership including an independent chair, and the inclusion of Indigenous representatives would be required for the CCG. MMG's community investment program should also be linked explicitly to the SIMP mitigation and community benefit strategies.

The Queensland Ambulance Service (QAS) requested to be kept updated on any issues that increases the potential for paramedic response to the work site or may impact on any emergency response to an accident, illness or injury as a consequence of this development.

As result of DOC and the DEEDI's comments MMG agreed to enhance training and employment opportunities for women and people with a disability, establish a 5% local Indigenous employment target from Year 5 onwards and provide Indigenous traineeship and apprenticeships as well as pre-apprentice courses, which aims to prepare prospective employees for a career in the mining industry. MMG also committed to identify and potentially mitigate any resulting impacts on regional housing, utilities and services and support workers who may opt to permanently relocate to the local area through their workforce accommodation strategy. DEEDI recommended that the proponent maximises on local economic opportunity by working with DEEDI and the Industry Capability Network (ICN) to make the most of local business employees' skills for project participation. Furthermore, the workforce should be encouraged to respect local community values and lifestyle through a code of conduct.

As a result of the comments made by several government agencies, MMG amended the SEIS and the social and economic impact assessment to incorporate those changes and to propose mitigation strategies. These included working closely with all stakeholders to take advantage of or mitigate these impacts, so as to ensure sustainable development of the project and the region. A community consultation process was initiated to allow the local community the opportunity to become informed and contribute to the development of the project. The revised SIMP includes MMG's CCG approach including the development of a charter, terms of reference, membership structure and stewardship (chair), as well as objectives and strategies, which would be progressed at the first CCG meeting. It was be intended that elections be held annually to allocate positions on the CCG and that the make-up of the CCG would reflect the diversity of project stakeholders and MMG's community investment program would be directly linked to its SIMP mitigation and community benefits strategies.

Through open and two-way stakeholder engagement, MMG would deliver the following impact mitigation strategies:

- Sustainable regional planning framework;
- Local education, training and employment training strategy;
- Local content plan/local business participation strategy;
- Indigenous participation strategy;
- Land access/land use management strategy;
- Community integration strategy;
- Community investment program;
- Community health and safety strategy;

- Short-term accommodation strategy;
- Workforce accommodation strategy;
- Employee induction program; and
- Employee relations strategy.

In consultation with stakeholders, the framework would be in place within six months of project start up and would be reviewed quarterly. MMG has developed a draft framework to provide structure and integrity in its monitoring and evaluation processes.

The SIMP process would be overseen by the project's community liaison officer, who would implement annual reviews of the plan for detailed reporting to the Social Impact Assessment Unit in the Department of Employment, Economic Development and Innovation.

4.16 Health and safety

The Health and Safety section of the EIS adequately addressed existing community values for public health and safety that may be affected by the project.

The EIS identified existing community values for public health and safety in order that they would be managed in a manner to prevent impacts on public health and prevent accidents both on the project site and in the surrounding community. The closest sensitive receiver (the Roseby Homestead) would lie 6 km south east of the processing area of the project and comprises of several houses, sheds, cattle yards, an airstrip, and several groundwater bores. The Roseby Copper Project mining camp is proposed to be constructed 11 km to the north east of the processing area of the Dugald River Project and would be the second closest sensitive receiver. Five other homesteads would be located between 28 and 32 km from the project. Other residences would be located within the towns of Kajabbi and Quamby, more than 30 km from the boundary of the proposed Dugald River Project. The project site would be situated approximately 65 km from central Cloncurry.

The EIS identified existing community values and expectations of public safety and health that may be affected by the project:

- Road safety on public roads to and from the project.
- The health and safety of employees due to the operation of the project.
- Air quality impacts from the operations including from TSP dust, PM_{10}, dust, arsenic, cadmium and lead.
- Noise impacts from the project.
- Spills of chemicals used on site (diesel fuel, oil and cyanide) causing land or waterway contamination off site.
- The release of contaminants in water used for dust control or stormwater from the project.
- Food safety and hygiene in the accommodation camp on the project.
- Providing appropriate health care and emergency care to employees on site.
- Standing water storages on the project may provide an environment for mosquito or biting midge populations.

The health implications created by the geology of the project area particularly relate to high metal content, both naturally occurring and through the concentration of the minerals during the project's operation. The most significant metal would be lead which could cause serious health issues for the workforce, environment and the community in general. Air modelling showed that levels were predicted to be below suggested DERM goals and guidelines and would not pose a threat to human health at the closest sensitive receiver. Noise modelling also showed that noise levels are well below the DERM proposed noise limits and that the EIS considered it likely that the cumulative impact of the Dugald River and the adjoining Roseby Copper Project would comply with the criteria.

MMG proposed a number of strategies, such as a Health and Safety Policy for on site mitigation as well as implementation of safety procedures and management plans prior to site establishment. To limit the off site noise, air, water and traffic impacts of the project on the health and safety of the surrounding community a suit of mitigation strategies would be implemented, such as stormwater dams, air quality and noise monitoring and road safety measures.

The Social Impact Assessment Unit at DEEDI commented that the Queensland Police Service should be consulted in the development of emergency response and crisis management plans, the traffic management plan and employee road/community safety awareness plans. MMG agreed to continue to work with all local emergency services in developing safety strategies for the project.

4.17 Economy

Traditionally, the economic base of the Cloncurry region is supported by transport, postal & warehousing followed by agriculture, forestry, fishing, and mining. The transport, postal, warehousing, and mining sectors employ more males than females in Cloncurry. The percentage of people in the labour force in Cloncurry is higher than the State average while the unemployment rate is lower. The most common occupation in Cloncurry is machinery operators, followed by technicians and trades workers then labourers. This reflects large employment in the mining industry.

The EIS stated that the project construction would result in a positive input into the local, Queensland and Australian economy of more than $700 million through the purchase of equipment, goods and services. During the operational phase of the project industries associated with mining would be positively impacted through the provision of services and equipment, and the supply of consumables to the project. The annual economic contribution of the project is estimated to be $160 million in operating expenditure, $14 million in royalties and $35 million in taxes, subject to metal prices and production at the time.

Five landholders would be directly affected by construction of the project and its associated infrastructure corridors on their land. One landholder commented on the EIS that although his property contains low intensity cattle grazing area, he still regards it as a valuable parcel of his land which contributes to the viability and profitability of his overall beef cattle operation. He is concerned about how the loss of this land would impact on him. MMG acknowledged that the proposed mining operation would impact on the landholder's operations and livelihood. MMG is negotiating compensation for the overall impact of the proposed mining operation on all affected parties. Compensation would be based on a range of factors, including not only the direct loss of land but also loss of amenity and diminution of the value of the remainder of the land.

Large coastal regional centres, such as Townsville and Brisbane, would benefit from the Dugald River Project with an increase of up to 0.9% in the employment sector. The EIS stated that the project would have minimal impact on local infrastructure and housing. The EIS further identified that the Dugald River Project is consistent with regional and state planning objectives as the Queensland Government is currently promoting mineral exploration, investment and growth in four major mineral regions (including the Mt Isa Region) by spending $20 million on the Smart Exploration initiative. The Smart Exploration initiative aims to make Queensland more attractive for investment in mining and development by providing geological and geophysical data. The Mt Isa region is recognised as a significant region by the Smart Exploration initiative and accordingly would become one of the four focus areas for mineral development. The Dugald River Project would comply with this initiative by developing a mine that would be operational for 23 years in the Mt Isa Region.

The current land use at the Dugald River Project mine site low intensity cattle grazing. While, some of the land could be rehabilitated for a mix of cattle grazing and native wildlife habitat, the expansion of the Dugald River Project would result in the permanent alienation of some land from the pre-mining land use. The project would have the potential to disturb in total approximately 611 ha of land in the first two to three years of construction and operation. This would include 297 ha on the main project site and 314 ha on the surrounding infrastructure corridors and access roads. The majority of vegetation that would be cleared due to the project is common and widespread in the region and MMG proposes to offset these biodiversity impacts. The proposed mine rehabilitation and closure proposed in the EIS aims to return the majority of the disturbed land to a similar pre-existing condition of low intensity grazing, native habitat or an agreed beneficial use. Some areas, for example the TSF, will be returned to a mix of native habitat rather than low intensity as the area will be more susceptible to erosion if grazing is allowed on the final landform.

As the workforce would be located on the project site in a purpose built accommodation camp, the project's adverse social impacts on Cloncurry would be minimised. In addition to stakeholder engagement initiatives, a number of mitigation strategies were identified in the social impact analysis.

4.18 Hazard and risk

An assessment into the hazards and risks associated with the Dugald River Project was undertaken to identify the potential of specific impacts to occur before and after the implementation of mitigation strategies. This risk assessment compared the likelihood and consequence of a range of environmental and social risks associated with the development of the project.

The EIS identified several high and one extreme risk prior to the implementation of mitigation strategies. All risks, except for one, were re-ranked as either medium or low following the implementation of mitigation strategies. The highest risk following mitigation was associated with wall failure of the TSF. A situation which has major consequences but low likelihood and which mitigation strategies can not improve the outcome. Mitigation strategies improved the ranking of the six remaining medium risks which related to seepage or overflow from the tailing storage facility and associated contamination, off site concentrate spillage, extreme rainfall events causing flooding and processing plant machinery causing noise nuisance at the nearest sensitive receiver. Risks would be reassessed prior to construction and following any changes to the operation of the project.

The Queensland Fire and Rescue Service (QFRS) commented that comprehensive emergency management plan would need to be developed through consultation with QFRS staff. The proponent would need to be self sufficient in emergency management/initial response via their own, adequately trained and equipped, emergency response teams, including training staff to manage wildfires originating on and external off the lease area and the lease operators should participate in annual discussions with neighbouring landowners to develop a holistic fire management program to mitigate the risk of wildfires. Consequently the SEIS was amended to contain an emergency response and contingency for the project and MMG would consult with Queensland Fire and Rescue Service, Queensland Ambulance Service, Emergency Management Queensland and interested underlying and neighbouring landholders during the development and review of any emergency response planning.

DTMR commented that the risk of raw cement or concentrate spill when transported in bulk to supply direct to project and to loading yard was not addressed in the EIS. The increase in use of bulk carriers would be subject to the same risks of spills as existing carriers. As a consequence the SEIS has been updated to include contingency plans for raw cement and concentrate spills.

The SEIS outlined the following procedures to contain possible hazards and risks:

- Dangerous goods information.
- Chemical inventory.
- Cyanide and other chemicals used would be managed in accordance with MMG's internal environmental standards for the management of cyanide and chemicals. These standards have been developed to be protective of human health and wildlife, and prevent spills, releases, leaks, overflows and unplanned chemical reactions. The MMG standard for management of cyanide is largely derived from the International Cyanide Management Code.
- The MMG standard for management of chemicals would be implemented to the selection, transportation, storage and use of chemicals during the design, construction, operation and rehabilitation and closure phases.
- Spillage and Emergency Management Plan and Contingency Plan would be outlined during site inductions and training programs for staff and contractors and would include the use of best practice techniques to control, clean up and remediate any spills that may occur on the project site.
- The Emergency Response and Contingency Plan (ERCP) would identify hazards and risks including wildfire, runoff, subsidence, traffic incidents and spill, and outline the responsibilities and procedures for dealing with the identified hazards and outline the appropriate emergency response procedures. This ERCP would be included in the site induction and training programs for staff and contractors.

4.19 Rehabilitation and decommissioning

The EIS reported that on closure and decommissioning of the project, the majority of disturbed land would be rehabilitated to a condition similar to the pre-existing condition of low intensity grazing, native habitat or an agreed beneficial use. The project proposed that only a small number of permanent MMG staff would remain on site, who would direct the services of varying number of contractor personnel engaged in rehabilitation works.

The three main areas that would be disturbed on the main project mining leases would be the processing plant/mining area, the accommodation camp area and the TSF.

The procedures of rehabilitation and decommissioning of the TSF and the waste rock dump was changed in the SEIS following DERM's concerns. DERM commented on the potentially acid forming nature of the tailings and the requirement that the final landforms at the cessation of mining would need to be non-polluting, stable, be able to withstand erosion and prohibit environmental harm to both surface waters and ground waters. MMG proposed that the rehabilitation of the TSF would include a capillary break, a low permeability sealing layer and a water-shedding layer of waste rock as capping material. This would be covered with topsoil and revegetated with shallow-rooting native species. The NAF waste rock dump would remain on mine closure, and would be rehabilitated by being shaped into a natural hill then ripped and seeded with native species. The top of the dump would be gently sloped to prevent water pooling on the surface. The rehabilitation strategy would no longer require materials won from the surrounding hilled areas to rehabilitate and revegetate the waste rock dump as originally described in the EIS.

Most of the stormwater dams, sediments ponds and roads on site would also be returned to their pre-mining land use and suitability. The water pipeline and power transmission line would be retained on mine closure as this infrastructure may be of beneficial use to the region or future mining operations. The stormwater dam downstream of the rehabilitated NAF/PAF waste rock dump would be retained to remove sediment from rainfall runoff from this permanent land form. The access road may also be retained through an agreement with the landholder.

On completion of mining, the underground declines and the box cut disturbance areas would be returned to safe and stable landforms, representative of the intended post mining land use. Rehabilitation methodology would include capping of the vertical declines with a concrete plug, backfilling of the vent raises and box cut with NAF material and spreading of topsoil and revegetation of the final landform surface. By sealing the underground declines with specifically designed concrete plugs the chances of subsidence into the underground workings would be greatly reduced. This methodology would ensure that the proposed subsequent land use is not compromised by surface instability or erosion. The EIS also outlined management strategies for dealing with topsoils as well as erosion management actions.

At the completion of rehabilitation activities on the project a Final Rehabilitation Report would be submitted. Relevant commitments provided in the EIS included:

- Return of the majority of disturbed land to a condition similar to the pre-existing condition of low intensity grazing or native habitat or to an agreed beneficial use.
- On rehabilitation of the project, disturbed areas would be made stable to ensure that the proposed subsequent land use would not be compromised by surface instability or erosion.
- Constructing landforms that would be geo-chemically stable to the extent that they would not impact on surface water or groundwater quality.

After appropriate surface preparation the disturbed land would be revegetated as follows:

- Spread fertiliser at approximately 100 kg/ha or as determined by rehabilitation trials.
- Native species occurring naturally in the local area would be chosen for areas requiring the re-establishment of local native habitat.
- Where practicable, revegetation would occur through direct seeding of selected species. Where direct seeding is not possible (e.g. small areas with limited access), seeds would be manually broadcast.
- A Weed Management Plan would be implemented to ensure revegetation initiatives are balanced with managing any existing weed species or those which are established due to land disturbance.

The EIS proposed several rehabilitation monitoring programs to monitor the success. These include annual monitoring of analogue and rehabilitation sites, erosion monitoring and establishing preliminary rehabilitation success criteria.

DERM requested information on rehabilitation strategies for the power line and water pipeline easement to cover the scenario that an agreement cannot be reached with a third party at the completion of the project. Although the SEIS addressed some of these concerns no specific rehabilitation strategy for any of the easements have been provided by MMG.

While MMG considers that the pipeline and power transmission line will be retained on mine closure, the SEIS states that in the event water the pipeline and powerline infrastructure would not be required by third parties upon completion of the project, they would be disassembled and completely removed.

5 Adequacy of the environmental management plan

The EM Plan developed through this EIS process has included input from DERM, other state government departments, local organisations, industry and the public. The EM Plan was found to be essentially complete and to contain sufficient commitments to future actions to inform the EIS process. However, some minor amendments will be needed as a result of this assessment report and specific details on a number of aspects, including water management, the PWD, and the TSF would be needed to complete conditions for the draft environmental authority. Hence, an amended EM Plan will be required that addresses the finding of this assessment and includes the necessary details for DERM to prepare the draft environmental authority for the project.

It is recommended that MMG obtain specific advice on the various aspects of the EM Plan and proposed conditions from the Mining and Heavy Industries Unit at DERM in Cairns before submitting any amended documentation.

6 Recommendations about the suitability of the project

The EIS process has compiled information about the proposed project, the values of the site and the potential impacts to those values. A range of mitigation measures and residual impacts are set out in the EIS and are summarised above in this assessment report. Importantly, one of the principal tools to implement those mitigation measures and environmental commitments is the environmental management plan (EM Plan). The EM Plan sets out how each matter is to be managed to deliver the acceptable environmental outcome.

7 Recommendations for conditions for any approval

7.1 Environmental Protection Act 1994

Throughout this EIS process, including development of the draft EM Plan, a range of environmental impacts and mitigation measures have been identified. Where that is the case and where legislation, policy or guidelines dictate, the actions of the project need to be constrained to achieve an acceptable environmental outcome.

This report has indicated that all the identified impacts as a result of the project are acceptable and can be adequately managed. However, while the proposed draft environmental authority conditions in the EM Plan are comprehensive and substantially meet the requirements under the Act, numerous details would need to be addressed in consultation with the administering authority before a finalised suite of conditions could be applied through a draft environmental authority.

7.2 Approvals under other legislation

7.2.1 Aboriginal Cultural Heritage Act 2003

MMG has entered into Cultural Heritage Management Plans (CHMP) with two recognised Native Title Claimant Groups covering the project area. These CHMPs were prepared under the statutory processes of the *Aboriginal Cultural Heritage Act 2003* and they clearly define how the project will avoid harm to Aboriginal cultural heritage, and where it cannot be avoided, to minimise harm to Aboriginal cultural heritage.

7.2.2 Transport Infrastructure Act 1994

As outlined in section 4.71 and 4.72 of this report a number of licences and permits for works within the state-controlled road network associated with the transport route and intersection upgrades under the *Transport Infrastructure Act 1994* would be necessary for the Dugald River Project. Upgrades to a level crossing across the railway and approvals for a load out facility at the rail head are required. Furthermore, for road transport, excess mass, over-dimensional loads or non-standard vehicle movements on state-controlled roads will require a permit under the *Transport Operations (Road Use Management) Act 1995*.

It is recommended that the proponent continue to liaise with the Network and Planning Unit of DTMR to discuss and resolve these outstanding issues and to obtain the necessary approvals.

Road

DTMR has advised that a road-use impact assessment including road-use and traffic management plans along with any necessary permits for any excess mass or over-dimensional loads associated with the project will be required prior to the commencement of any Dugald River Project construction works.

DTMR has advised that the following requirements should apply to the project regarding Road Impact Assessment and Road-Use Management Plan. Prior to the commencement of any construction works on site, the proponent shall:

- Review and finalise the road impact assessment (RIA) that includes details of all of the project's transport impacts on the safety and efficiency of state-controlled roads and proposed mitigation works/contributions to address these impacts in accordance with Guidelines for Assessment of Road impacts of Development (2006) and a Pavement Impact Assessment methodology (to be provided by the DTMR North West office) in consultation with the Manager (RS&C) of DTMR North West Office; then submit the RIA to the Manager (RS&C) DTMR North West Office for review and approval.
- Prepare a road-use management plan (RMP) for all use of state-controlled and other roads for each phase of the project. The RMP will detail traffic volumes, proposed transport routes, required road infrastructure maintenance and/or upgrades to mitigate road impacts, any necessary conditions about access/connection to public roads, transport scheduling, dust control and road safety. The RMP is to include arrangements to ensure compliance with the management of workforce movements associated with the project. DTMR must approve the plan prior to implementation.
- Prior to commencement of any construction works on site, the proponent shall prepare a Traffic Management Plan (TMP) for all construction and other activities in the state-controlled road corridor.
- Provide upgrade / improvement works and any necessary road maintenance and upgrades identified in the finalised RMP to ameliorate any adverse impacts of the road use by the project on the assets of DTMR.
- Obtain the relevant licenses and permits under the Transport Infrastructure Act (Qld) 1994 for works within the state-controlled road corridor.
- Incorporate a provision that prior to commencing any program of oversize transport movements that may be required for the construction of the project, the proponent will consult with DTMR, the Queensland Police Service and Cloncurry Shire Council.
- Obtain the necessary permits for any excess mass or over-dimensional loads associated with the project as required under the Transport Operations (Road Use Management) Act (Qld) 1995.

Infrastructure Agreement

The proponent may enter into an Infrastructure Agreement with DTMR for:

1. Contribution or upgrade to the following intersections as determined and agreed upon with DTMR North West Regional Office
2. Burke Developmental Road (89A) / Dugald River Project access road; and
3. Any other intersection determined as being impacted by the project

Rehabilitation and maintenance contributions associated with project traffic as calculated and agreed upon with DTMR North West Regional Office. This Infrastructure Agreement between the proponent and DTMR should be finalised prior to commencement of any construction works on site.

Rail

DTMR have advised that matters concerning impacts on railways, particularly crossings and the rail load out facility remain to be resolved. To progress implementation of these measures the proponent should liaise with DTMR North West Regional Office (Cloncurry) and with Queensland Rail.

DTMR requires that the proponent is to commit to the provision of satisfactory level crossing protection at the rail crossing ID4037 Aerodrome Road/Sir Hudson Fysh Drive. As a minimum this level crossing protection will be identified in a revised ALCAM assessment and comprise a flashing light assembly. Further investigations are to be carried out into the provision of flashing lights and boom gates. This further investigation is to be carried out in consultation with DMR (North West Regional Office - Cloncurry), Queensland Rail and the Cloncurry Shire Council.

The Queensland Rail contact for this purpose is Bruce Heazlewood, Project Manager Network Projects Tel 3235 3177, GPO Box 1429 Brisbane Qld 4001.

8 Suitability of the project

DERM has considered the submitted EIS, all submissions and the standard criteria. The project is assessed here as being suitable on the basis of the EM Plan being completed and the subsequent environmental authority, if granted, being conditioned suitably to implement the specific environmental protection commitments set out in the EIS and summarised here in this EIS assessment report. Consequently, the project is considered suitable to proceed to the next stage of the approval process noting that the recommendations of this EIS assessment report should be fully implemented.

9 Approved by

	15 November 2011
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