Environmental Impact Statement (EIS) assessment report under the Environmental Protection Act 1994

for the Taroborah Coal Project

proposed by Shenhuo International Group Pty Ltd

Prepared by: Impact Assessment & Operational Support, Department of Environment and Heritage Protection

February 2015

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Abbreviations and acronyms

AHD – Australian height datum

ALCAM – Australian level crossing assessment model

AMD – acid mine drainage

ANZECC (2000) – Australian and New Zealand Environment and Conservation Council, 2000

AS – Australian standard

BIBO – Bus-in-bus-out

CHMP – cultural heritage management plan

CHPP – coal handling and processing plant

CHRC – Central Highlands Regional Council

DATSIMA – Department of Aboriginal and Torres Strait Islander and Multicultural Affairs

dB(A) – A-weighted decibels

DIDO – drive-in-drive-out

DOTE – Australian Government Department of the Environment

DSDIP – Department of State Development, Infrastructure and Planning

DNRM – Department of Natural Resources and Mines

DTMR – Department of Transport and Main Roads

EA – environmental authority

e.g. – for example

EHP – Department of Environment and Heritage Protection

EIS – environmental impact statement

EP Act – *Environmental Protection Act 1994*

EPBC Act – *Environment Protection and Biodiversity Conservation Act 1999*

ERA – environmentally relevant activity (as defined in Schedule 2 of the EP Act)

etc. – et cetera

FIFO – fly-in-fly-out

GARID – Guidelines for Assessment of Road Impacts of Development

GDEs – groundwater dependant ecosystems

ha – hectares

HHMP – historic heritage management plan

i.e. – that is

IESC – Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development

IRMP – integrated risk management plan

kg – kilograms

km – kilometres

km/h – kilometres per hour

km^2 – kilometres squared

lcm – loose cubic metres

m – metres

MDL – Mineral development licence

mg/L – milligrams per litre

ML – megalitres or mining lease

ML/day – megalitres per day

mm – millimetres

mm/y – millimetres per year

MNES – matters of national environmental significance (as defined in the EPBC Act)

MR Act – *Mineral Resources Act 1989*

MSES – matters of State environmental significance

m/s – metres per second

Mt/y – million tonnes per year

NAF – non-acid forming

NC Act – *Nature Conservation Act 1994*

NPV – net present value

NTU – nephelometric turbidity units

PAA – priority agricultural area

PAF – potential acid forming

PAF–LC – potential acid forming–low capacity

$PM_{2.5}$ – particulate matter less than two point five micrometres in diameter

PM_{10} – particulate matter less than ten micrometres in diameter

QR – Queensland Rail

REMP – Receiving environment monitoring program

RIA – road infrastructure agreement

RIDA – regional interests development approval

RMP – road-use management plan

ROM – run-of-mine

RPI Act – *Regional Planning Interests Act 2014*

SCA – strategic cropping area

SCL – strategic cropping land

SIA – social impact assessment

SIMP – social impact management plan

SMU – soil management unit

t – tonnes

TEC – threatened ecological community

the proponent – Shenhuo International Group Pty Ltd

TI Act – *Transport Infrastructure Act 1994*

TOR – terms of reference

TSP – total suspended particulates

WICET – Wiggins Island Coal Export Terminal

WQO – water quality objective

$\mu g/m^3$ – micrograms per metre cubed

µS/cm – microSiemens per centimetre

°C – degrees Celsius

1 Introduction

This report provides an evaluation of the environmental impact statement (EIS) process pursuant to Chapter 3 of the *Environmental Protection Act 1994* (EP Act) for the Taroborah Coal Project proposed by Shenhuo International Group Pty Ltd (the proponent). The proponent is a Brisbane based coal exploration and development company, and is a subsidiary of the Henan Shenhuo Group Co Ltd.

On 12 December 2011, the proponent applied under sections 70 and 71 of the EP Act for approval to voluntarily prepare an EIS. The Department of Environment and Heritage Protection (EHP) approved the application under section 72 of the EP Act. The draft terms of reference (TOR) were publicly advertised in April/May 2012 for comment. Following this public consultation, the TOR were finalised on 2 August 2012.

EHP coordinated the EIS process as the administering authority of the EP Act. This EIS assessment report has been prepared pursuant to sections 58 (Criteria for preparing report) and 59 (Required content of report) of the EP Act.

1.1 Criteria considered when preparing this report

Section 58 of the EP Act lists the criteria that EHP must consider when preparing an EIS assessment report. The criteria are:

a) the final terms of reference (TOR) for the EIS

   The final TOR were issued to the proponent on 2 August 2012, and have been considered when preparing this EIS assessment report (Refer to section 5).

b) the submitted EIS

   The submitted EIS comprises:

   - the EIS (Volumes 1 to 4) that was available for public comment from 15 May to 26 June 2014
   - the response to submissions and the amended EIS received by EHP on 24 November 2014
   - amended section 3.7, Rehabilitation and decommissioning, and section 6.1, Environmental commitments received by EHP on 21 January 2015.

   All the components of the submitted EIS has been considered when preparing this EIS assessment report.

c) all properly made submissions and any submissions accepted by the chief executive

   EHP received 24 properly made submissions on the submitted EIS within the submission period. Two additional (not properly made) submissions were received after the submission period had ended. All submissions (including the two submissions that were not properly made) were accepted under section 55 of the EP Act. Those submissions were received from the following stakeholders:

   - Aurizon
   - Australian Government Department of the Environment (DOTE)
   - Central Highlands Regional Council (CHRC)
   - Department of Agriculture, Fisheries and Forestry
   - Department of Aboriginal and Torres Strait Islander and Multicultural Affairs (DATSIMA)
   - Department of Energy and Water Supply
   - Department of Housing and Public Works
   - Department of Justice and Attorney General
   - Department of Natural Resources and Mines (DNRM)
   - Department of State Development, Infrastructure and Planning (DSDIP)
   - Department of Tourism, Major Events, Small Business and the Commonwealth Games
   - Department of Transport and Main Roads (DTMR)
   - Ergon Energy
   - Fitzroy Basin Association
   - Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC)
   - Queensland Ambulance Service
   - Queensland Fire and Emergency Services (QFES)
   - Queensland Police Service (QPS)
   - SunWater.

Another seven submissions were received from members of the public. EHP provided its own submission to the proponent on the EIS.

In addition, there has been additional correspondence from stakeholders regarding the proponent's response to submissions on the EIS and amendments to the EIS as a result of the submissions. All submissions and other comments made by stakeholders on the EIS documents were considered when preparing this EIS assessment report.

d) the standard criteria

The standard criteria are listed in Schedule 4 of the EP Act, and have been considered when preparing this EIS assessment report.

e) another matter prescribed under a regulation

There are no other matters prescribed under a regulation that must be considered when preparing an EIS assessment report.

1.2 Required content of report

Section 59 of the EP Act outlines the required content of the report, which must:

a) address the adequacy of the EIS in addressing the final TOR
   - The adequacy of the EIS in addressing the final TOR is addressed in section 5 of this report.

b) address the adequacy of any environmental management plan (EM plan)
   - the final TOR required the proponent to prepare an EM plan for the project. However, amendments to the EP Act came into force on 31 March 2013 and included, amongst other things, removal of the requirement for a project to include an EM plan if an environmental authority (EA) application had not been received by 31 March 2013. Because the proponent had not submitted an EA application to EHP by 31 March 2013 an EM plan was no longer required to be prepared for the project.

c) make recommendations about the suitability of the project
   - Recommendations about the suitability of the project are outlined in section 6 of this report.

d) recommend any conditions on which any approval required for the project may be given
   - The recommended conditions for the environmental authority (EA) for the project are included in Appendix 1 of this report.

e) contain another matter prescribed under a regulation
   - Section 9 of the Environmental Protection Regulation 2008 (EP Reg) requires this EIS assessment report to contain the following matters:
     1. a description of the following:
        a) the project
        b) the places affected by the project
        c) any matters of national environmental significance (MNES) likely to be affected by the project
     2. a summary of the project's relevant impacts
     3. a summary of feasible mitigation measures or changes to the project or procedures to prevent or minimise the project's relevant impacts, proposed by the proponent or suggested in a relevant submission
     4. to the extent practicable, a summary of feasible alternatives to the project identified in the assessment process and the likely impact of the alternatives on MNES
     5. to the extent practicable, a recommendation for any conditions of approval for the project that may be imposed to address impacts identified in the assessment process on MNES.

Section 2 of this report summarises a description of the project. Section 5.2.1 of this report summarises the places affected by the project. Appendix 2 outlines the MNES likely to be affected by the project. A summary of the project's relevant impacts and feasible mitigation measures or changes to the project are discussed throughout sections 5 of this report. Appendix 2 of this report contains a summary of feasible alternatives and the likely impact of the alternatives on MNES. The Australian Government Department of the Environment (DOTE) will develop conditions of approval to address impacts on MNES after the completion of the EIS process for the project.

1.3 Completion of EIS process for the project

The giving of this assessment report to the proponent completes the EIS process for the Taroborah Coal Project under section 60 the EP Act.

1.4 Accredited process for the controlled action under Commonwealth legislation

On 20 February 2012 the project was declared a controlled action under the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), including that it be assessed through the EP Act EIS process under the agreement between the Commonwealth of Australia and the State of Queensland (the bilateral agreement) relating to environmental impact assessment. The controlling provisions are sections 18 and 18A (listed threatened species and communities), sections 20 & 20A (listed migratory species) and sections 24D and 24E (water resources). An assessment of the significance of impacts of the action on the controlling provisions is contained in Appendix 2 of this report. A copy of this report will be given to the Commonwealth Environment Minister, who will decide whether to approve or refuse the controlled action under Part 9 of the EPBC Act.

1.4.1 Independent Expert Scientific Committee

The Australian Government established an Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (IESC) in late 2012 through amendment to the EPBC Act. The IESC provides advice to the Commonwealth Environment Minister on research priorities to improve the understanding of potential impacts of coal seam gas and large mining developments on water resources. The committee can be requested by federal, state and territory governments to provide advice on water resource related aspects of environmental impact assessments.

DOTE and EHP referred the EIS for the project to the IESC on 7 May 2014. The committee's advice to the departments dated 12 June 2014 has been considered in the preparation of this assessment report (see Appendix 2 of this report).

2 Description of the project

The proposed Taroborah Coal Project would include the construction and operation of an open-cut and underground coal mine on a greenfield site. The project site lies in the Denison Trough of the Bowen Basin approximately 22 kilometres (km) west of Emerald within the Central Highlands Regional Council local government area in Central Queensland (Figure 2-1). The open-cut mining area lies to the south of the Central West rail system and the Capricorn Highway. The underground mining area lies to the north of the Central West rail system and the Capricorn Highway. An indicative project layout is shown in Figure 2-2.

The proposed project would be carried out on mineral development licence (MDL) 467, covering approximately 7,966 hectares (ha). The disturbance footprint associated with the open-cut and underground operations is estimated to cover 2,568ha. A breakdown of disturbance is provided in Table 2-1.

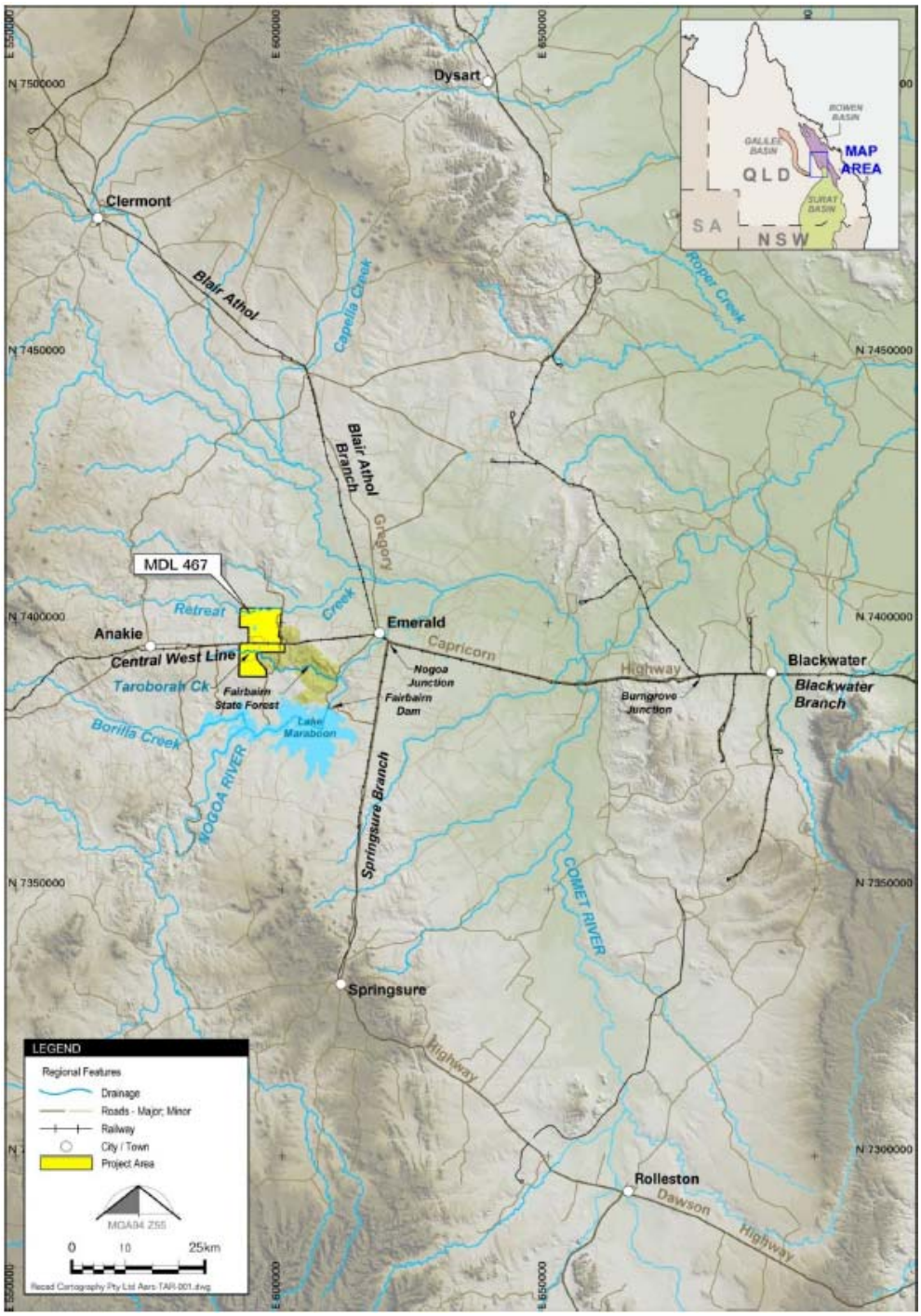
Table 2-1 A breakdown of the disturbance footprint

Disturbance	Area (ha)
Open-cut mining, including dumps and haul roads	336
Underground (longwall) mining	2,071
Coal handling and preparation plant (CHPP), mine infrastructure and site offices	58
Rail balloon loop, sediment dams, CHPP water recycle dam and mine waste water dam	50
Visual amenity bunds	16
Total:	**2,568**

Source: Table 3.3 of the EIS

The life of the project would be approximately 22 years, including an initial twelve month construction phase, 20 year production period and a 15 month decommissioning and rehabilitation phase. An additional six month construction phase, in preparation for underground mining, would occur in parallel with open-cut mining, and would begin in the fifth year of the project.

Figure 2-1 Local project location



Source: Figure 1.2 of the EIS

Mining would target the A and B seams, which are thought to be equivalent to the Cetus and Cygnus seams of the Freitag Formation. The A and B seams range from 0.1 to 1.9 metres (m) thick and 2.3 to 3.0m thick respectively, and lie at depths of 30m to 200m. The project would recover approximately 11.5 million tonnes (Mt) of run-of-mine (ROM) thermal coal from the open-cut pit and 64.3Mt of ROM thermal coal from the underground operation. Initially, 0.5Mt of ROM coal would be mined in the first year. The rate would progressively increase up to 5.75Mt a year (Mt/y) of ROM coal in year 8. Open-cut mining would overlap with underground mining between years 5 to 7 and would cease after the seventh year. Between years 8 to 20, underground mining would continue to produce up to 5.75Mt/y of ROM coal.

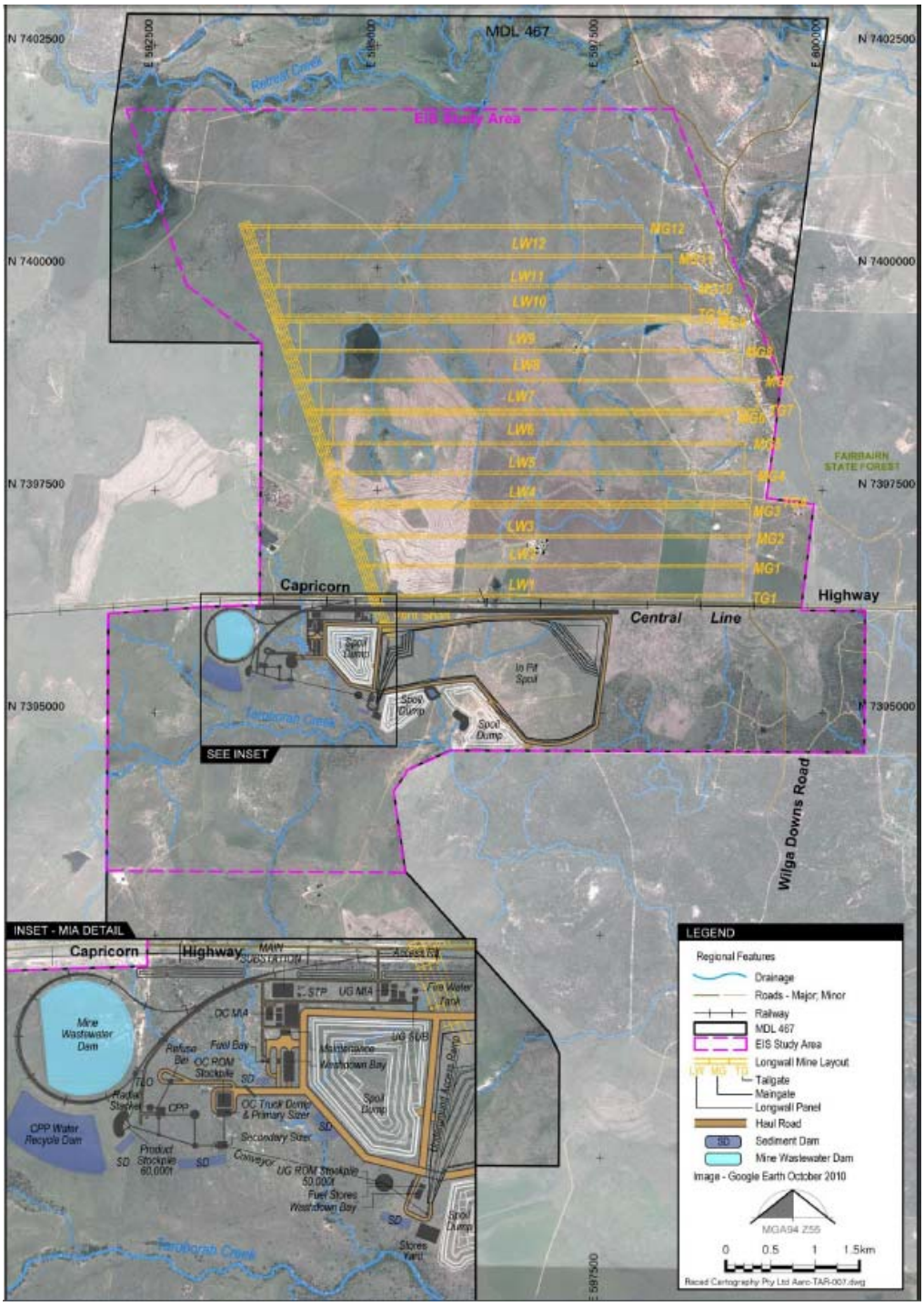
Open-cut mining would be carried out using conventional hydraulic excavators and a fleet of dump trucks to remove overburden and extract the coal resource. ROM coal from the open-cut pit would be loaded onto trucks and hauled to an on-site coal handling and processing plant (CHPP). Overburden would be hauled by truck, initially to out-of-pit spoil dumps adjacent to the open-cut pit. Once mining of the pit has progressed sufficiently, spoil would be progressively backfilled in the advancing pit.

Underground mining would be carried out by longwall extraction techniques. ROM coal from the underground operations would be transported by conveyors via the open-cut highwall to the CHPP for processing.

Processing at the CHPP would involve crushing, screening and washing of ROM coal in order to separate product coal from coarse and fine reject materials. Fine rejects from the CHPP would be partially dewatered and mixed with coarse rejects, prior to being hauled and buried in the spoil dumps.

Up to 5.73Mt/y of product coal would be transported from the project site via the Queensland Rail (QR) Central West rail system and the Aurizon Blackwater rail system to the Wiggins Island Coal Export Terminal (WICET) at the Port of Gladstone for export. The coal transport option would require the construction of a new on-site train load-out facility and rail loop to connect the mine to the Central West rail system, as well as an upgrade of the Central West rail line.

Figure 2-2 Proposed project layout



Source: Figure 3.5 of the EIS

Site access by road would be via the Capricorn Highway, which passes east-west through the middle of MDL467.

The construction and operation phases of the project would employ up to 150 and 375 full-time staff respectively. Construction and operational workforces would use a bus-in, bus-out (BIBO) transportation system from Emerald to the project site. All staff would live in Emerald or the surrounding townships in either permanent or temporary accommodation while on roster.

The annual raw water demand during the proposed 22 year life of the project is estimated to range from 330 megalitres (ML) per year during initial construction up to 2,680ML per year during peak open-cut and underground operations. Water would be sourced from coal seam dewatering and the collection of rainfall run-off in surface water storages. No surface water allocations are proposed for the project.

Flood protection bunds would be constructed to a nominal height of 0.5m, and would be designed to protect the open-cut pit and mine infrastructure area (MIA) from local flooding up to a 1-in-1000 year peak flow event.

A 66 kilovolt (kV) overhead feeder line running parallel to the Capricorn Highway is proposed to be connected to the Emerald substation located 22km to the east of the project site. It would supply 25 megawatts (MW) of electricity per year during peak project operations.

Key features of the conceptual rehabilitated final landform design for the project include:

- two final voids covering approximately 292ha on the southern side of the Capricorn Highway on MDL467
- elevated landforms associated with out-of-pit spoil dumps covering approximately 93ha on the southern side of the Capricorn Highway on MDL467
- landforms at-grade or only slightly below pre-mining topography associated with subsided areas from underground mining, covering approximately 2071ha
- landforms at-grade associated with rehabilitated infrastructure areas covering approximately 69ha.

3 The EIS process

The proposed Taroborah Coal Project was assessed by an EIS process under Chapter 3 of the EP Act. Table 3-1 provides a timeline of the key steps undertaken during the EIS process under the EP Act.

Table 3-1 The key steps undertaken during the Taroborah Coal Project EIS process

Step in the EIS process	Section of the EP Act	Responsibility for taking step	Statutory due date	Date completed
Application to voluntarily prepare an EIS was received by EHP	ss. 70 & 71	Proponent	N/A[1]	13/12/2011
Decision to approve the voluntary preparation of an EIS was given to the proponent	s. 72	EHP	N/A	16/12/2011
Written notice of decision to approve the voluntary preparation of an EIS was given to the proponent	s. 72	EHP	13/01/2012	21/12/2011
EHP received a draft TOR for the project accompanied by the fee prescribed under the EP Reg.	s. 41(1) & 41(2)	Proponent	N/A	12/03/2012
Written notice about the draft (TOR notice) for public notification was given to the proponent and the comment period was set at 30 business days	ss. 42(1) & 42(2)	EHP	2/04/2012	29/03/2012
The TOR notice was published in the Central Queensland News and The Courier-Mail newspapers	s. 43(1)	EHP	5/04/2012	30/03/2012 & 31/03/2012
Copies of the TOR notice were given to interested and affected persons [no other persons were decided by the chief executive under s. 43(3)(c)]	s. 43(3)	Proponent	5/04/2012	5/04/2012
The draft TOR comment period commenced on 2 April 2012 and concluded on 17 May 2012 [30 business days in total]	s. 42(3)	N/A	2/04/2012 to 17/05/2012	17/05/2012
Twenty sets of comments received during the comment period were given to the proponent	s. 44	EHP	31/05/2012	28/05/2012

Step in the EIS process	Section of the EP Act	Responsibility for taking step	Statutory due date	Date completed
EHP received advice in response to the 20 sets of comments	s. 45, & s. 11 of EP Reg.	Proponent	26/06/2012	6/07/2012
EHP considered the proponents' advice, finalised the TOR, gave a copy of the final TOR to the proponent, published the final TOR on the EHP website and published notices about the final TOR in the Central Queensland News and The Courier-Mail newspapers	s. 46, & s. 12 of EP Reg.	EHP	3/08/2012	2/08/2012
The proponent submitted the EIS to EHP	s. 47	Proponent	2/08/2014	8/01/2014
A longer period was agreed for deciding whether the EIS was suitable to proceed and an information request was issued to the proponent on 6 February 2014. The proponent submitted a revised EIS in response to the information request on 18 March 2014. A decision was made that the EIS was suitable to proceed on 15 April 2015	ss. 49(1), 49(2) and 62, & s. 13 of EP Reg.	EHP	16/04/2014	15/04/2014
Notice of decision that the EIS is suitable to proceed to public notification, and that the submission period would be 30 business days, was given to the proponent	ss. 49(3) to 49(5)	EHP	2/05/2014	29/04/2014
A copy of the EIS notice was given to interested and affected persons [No other persons were decided by the chief executive]	s. 51(2)(a)	Proponent	27/05/2014	14/05/2014
The EIS notice was published in the Australian (as prescribed under a regulation), The Courier-Mail and the Central Queensland News newspapers, and on the EHP website [No other way was decided by the chief executive]	s. 51(2)(b), & s. 8 of EP Reg	Proponent	27/05/2014	14/05/2014
The EIS submission period commenced on 15 May and concluded on 26 June 2014	s. 52(2)	N/A	15/05/2014 to 26/06/2014	26/06/2014
EHP received a declaration of compliance stating that a copy of the EIS notice had been given to interested and affected persons and that the approved form of the EIS notice had been published in relevant newspapers	s. 53	Proponent	28/05/2014	16/05/2014
Twenty-four submissions about the submitted EIS were received and accepted during the submission period were forwarded to the proponent. EHP also provided its own submission on the EIS to the proponent. Two late submissions were also accepted and forwarded to the proponent on 24 July and 7 August 2014.	ss. 55 & s56(1)	EHP	10/07/2014	10/07/2014
The proponent's response to submissions was received by EHP	s. 56(2)	Proponent	15/02/2015	24/11/2014
EHP considered the submitted EIS, the proponent's response to submissions and decided to allow the EIS to proceed under divisions 5 (EIS assessment report) and 6 (Completion of process)	ss. 56A(1), to 56A(3)	EHP	5/01/2015	5/01/2015
A notice of the decision to proceed was issued to the proponent	s. 56A(4)	EHP	19/01/2015	19/01/2015
EIS assessment report completed and issued to the proponent completing the EIS process	ss. 57 to 60	EHP	3/03/2015	3/03/2015

Table Notes: 1. N/A – Not applicable

4 Project approvals

The necessary approvals for the project are summarised in Table 4-1.

Table 4-1 Approvals required for the Taroborah Coal Project

Approval	Legislation (Administering Authority)	Detail
Approval to undertake an action that may impact on a matter of national environmental significance (MNES), including nationally listed threatened species and ecological communities, migratory species and water resources. Refer to section 1.4 and Appendix 2 for details	EPBC Act (DOTE)	A copy of this report will be given to the Commonwealth Minister to assist with making a decision about the approval of the project and any conditions that should apply under Part 9 of the EPBC Act
Environmental authority (EA)	EP Act, Chapter 5 (EHP)	On completion of the EIS process the proponent would apply for an EA for approval to mine up to 5.75Mt/y of black coal (Recommended EA conditions are contained in Appendix 1)
Grant of mining lease	*Mineral Resources Act 1989* (Department of Natural Resources and Mines - DNRM)	After EHP has issued the EA to the proponent, DNRM would decide whether or not to grant a mining lease for the project
Regional Interests Development Approval (RIDA)	*Regional Planning Interests Act 2014* (Department of State Development, Infrastructure and Planning – DSDIP)	After completion of the EIS process the proponent would assess whether the mining lease boundary (yet to be determined) overlaps with any areas of regional interest under the Central Queensland Regional Plan (potentially including a strategic cropping area (SCA) and priority agricultural area (PAA) identified on MDL467). If so, the proponent would apply to DSDIP for a RIDA.
Water licence to take or interfere with water from a water course, overland flow or groundwater. If the taking of, or interfering with, water is temporary, a water permit would be required	*Water Act 2000* (DNRM)	Following completion of the EIS process the proponent would apply to DNRM for a water licence, and/or a water permit
Cultural heritage management plan	*Aboriginal Cultural Heritage Act 2003* (EHP)	A CHMP is being negotiated with the relevant Aboriginal management body

Environmentally relevant activities

The EA would also authorise 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 listed in Schedule 2 of the EP Act):

- ERA 8 Chemical storage
- ERA 15 Fuel storage
- ERA 16 Extracting and screening
- ERA 33 Crushing, milling, grinding or screening
- ERA 63 Sewage treatment plant.

Notifiable activities

Notifiable activities are activities that have the potential to cause land contamination and are listed in Schedule 3 of the EP Act. The following notifiable activities being undertaken for the project would also be authorised under the project EA:

- 24. Mine wastes
- 29. Petroleum products or oil storage.

5 Adequacy of the EIS in addressing the final TOR

The final TOR for the Taroborah Coal Project were issued to the proponent on 2 August 2012. The final TOR outline the information required to be included in the EIS. A copy of the final TOR was included in Appendix 1 of the EIS. This section of the EIS assessment report discusses whether the various sections of the EIS adequately addressed the final TOR.

Executive summary

Volume 1 of the EIS included an executive summary as a stand-alone section. The executive summary adequately described the project and conveyed the most important aspects and environmental management options and key issues and conclusions, in a concise and readable form, as required by the final TOR.

Glossary of terms

Volume 1 of the EIS provided an adequate glossary of technical terms and acronyms used in the EIS.

Introduction

Volume 1, section 1 of the EIS included an Introduction to the EIS process for the project. It adequately discussed the purposes of undertaking the EIS process for the project, the relevant legislation and policies and approvals applicable to the project and the relevant audience of the EIS, as required by the final TOR.

The Introduction also included adequate information about the following aspects:

- project proponent
- brief project description
- project objectives and scope
- the EIS process for the project
- project approvals.

Project need and alternatives

Volume 1, section 2 of the EIS discussed the project need and alternatives, including project justification and project alternatives. It adequately justified the need for the project and discussed alternative project infrastructure layouts, and various alternatives considered for mining and processing, product transport, workforce and accommodation, water supply, and power supply.

Description of the project

Volume 1, section 3 of the EIS provided a detailed project description in terms of the local and regional context of the project. It adequately described the sequencing of construction, operations and rehabilitation activities and outlined how liquid, gaseous and solid wastes generated by the project would be managed. It also adequately discussed the off-lease, ancillary activities associated with product handling and transport, workforce transport and accommodation, and energy and water supply.

A description of the project is provided in section 2 of this report.

Environmental values and management of impacts

The rest of this section includes the following information about each environmental value listed in the final TOR:

- a summary of each environmental value, as identified in the EIS
- a summary of the project's relevant impacts on each environmental value, as identified in the EIS
- a summary of feasible mitigation measures to minimise the identified impacts on each environmental value, as identified in the EIS
- a summary of the major issues raised in the EIS submissions and the proponent's response to the submissions, and an assessment on whether the amendments to the EIS adequately addressed the issues
- a summary of any outstanding issues, or further actions required by the proponent to meet state policy and legislative requirements, identified during the EIS assessment process, and any recommendations to address these issues.

5.1 Climate

Section 4.1 of the EIS described the local and regional climatic conditions in the vicinity of the Taroborah Coal Project. Climate information was used in subsequent sections and appendices of the EIS (particularly air, noise, surface water and groundwater assessments) to assist with making predictions about likely project impacts.

The EIS adequately described the local and regional climate and how the climate would affect the potential for environmental impacts and the management of operations at the site.

The proposed mine site is only 8km south of the Tropic of Capricorn, and consequently the climate of the region is transitional between sub-tropical and tropical. The average annual rainfall is 650mm measured at Anakie, 19km west of the project site, and this occurs mainly in the wet season months of summer around January and February. Average monthly rainfall at Anakie ranges from about 110mm in February to 21mm in August.

Evaporation peaks in the summer months and averages 2,120mm/year, which is substantially higher than the average annual rainfall.

Temperatures range from a mean maximum temperature of 34.8 degrees Celsius (°C) in December to a mean minimum temperature of 6.9°C in July.

The prevailing mean annual wind direction is from the south-east. The mean prevailing wind directions during summer and spring vary from the south-east, east and the north-east. The mean prevailing wind direction during autumn is from the south-east. The mean prevailing wind direction during winter is predominantly from the south-east. Wind speeds are generally light (<10km/h) for approximately 80% of the time, and are greater than 20km/h for only a few percent of the time.

The relevance of climate to the Taroborah Coal Project is discussed in later sections of this report. The impacts of rainfall on soil erosion are discussed in section 5.2, Land. The impacts of storm events with regard to the design of waste containment systems and bunding, are discussed in section 5.4, Waste. The impacts of storm events with regard to stormwater management and tailings dams, are discussed in section 4.5, Water. The impacts of winds, rain, humidity and temperature inversions on air and noise quality, are discussed in section 5.6, Air, and section 5.7, Noise and vibration.

5.2 Land

The EIS adequately addressed the requirements of the final TOR for land associated with the Taroborah Coal Project. Section 4.2 of the EIS provided a detailed description of the existing land environmental values that may be affected by the project. Appendices 7, 8, 9 and 10 of the EIS presented detailed assessments of soil and land suitability, contaminated land, visual amenity and surface subsidence respectively. Section 4.2.2 of the EIS outlined the potential impacts of the project on land and the proposed mitigation measures.

5.2.1 Places affected by the project

MDL467 overlies parts of both the Capricorn Highway and the Central West rail line, which may be impacted in terms of increased usage and potential need for modifications. The majority of MDL467 is used for beef cattle grazing and some areas of rain-fed, broadacre cropping. Table 5-1 details the predominant land use of the lots on plans that underlie the project area on MDL467.

Table 5-1 Real property descriptions underlying MDL467

Real property description	Tenure type	Nature of the land
Lot 76 on plan PT372	Freehold	Private agriculture
Lot 12 on plan RP881318	Freehold	Private agriculture
Lot 13 on plan RP881318	Freehold	Private agriculture
Lot 14 on plan RP881318	Freehold	Private agriculture
Lot 15 on plan PLA4029	Freehold	Private agriculture
Lot 126 on plan PT372	Freehold	Private agriculture
Lot 21 on plan DSN29	Freehold	Private agriculture

Lot 201 on plan DN40176	Freehold	Private agriculture
Lot 23 on plan DN40176	Freehold	Private agriculture
Lot 24 on plan DN40201	Freehold	Private agriculture
Lot 20 on plan DSN377	Freehold	Private agriculture
Lot 124 on plan PT367	Leasehold	Private agriculture
Lot 203 on plan DSN377	Freehold	Private agriculture
Lot 4 on plan PT352	Leasehold	Private agriculture
Lot 12 on PT352	Leasehold	Private agriculture
Lot 81 on SP122079	State land	Queensland Rail, railway corridor
Lot 82 on SP122079	State land	Queensland Rail, railway corridor
Lot 101 on SP122080	State land	Queensland Rail, railway corridor
Lot 5 on PT132	State land	Queensland Rail, Capricorn Highway

Source: Table 4.6 of the EIS

5.2.2 Potential impacts and proposed mitigation measures

A summary of the potential impacts on the environmental values of land and the mitigation measures proposed in the EIS is outlined below.

5.2.2.1 Land use and suitability, subsidence and land disturbance

The potential impacts of the project on land use and suitability include:

- changes to land-use in open-cut areas to the south of the Capricorn Highway (e.g. out-of-pit spoil dumps, final void, alteration to physical and chemical properties of soils)
- Class A good quality agricultural land with the potential to support broadacre cropping located to the south of the Capricorn Highway would be temporarily or permanently impacted by mine infrastructure
- a strategic cropping area (SCA) and priority agricultural area (PAA) located to the north of the Capricorn Highway would be temporarily disturbed (i.e. changes to hydrology and pooling of water) by subsidence caused by underground mining
- subsidence modelling predicts a typical differential of 0.8m over 110m and a maximum of 1.1m over 130m in areas of strategic cropping land (SCL).

Most of the land disturbed during the construction and operational phases of the project would be rehabilitated. However, there would be some reduction in land suitability in some areas, such as out of pit spoil dumps. The two final voids from the open-cut operations would be the only non-beneficial final land use. The proposed measures to mitigate the land disturbance impacts of the project include:

- temporarily disturbed areas of the site, including an SCA and PAA, would be re-profiled, covered with topsoil and reseeded and returned to primary production land uses
- permanently disturbed areas of the site, including the final voids, would be rehabilitated to a conservation land use
- topsoil would be stripped and stockpiled for use in rehabilitation
- topsoil stockpiles would be bunded to reduce soil loss from erosion, and soil ameliorant, such as lime or gypsum, would be applied to maintain the physical properties of soils
- surface tension cracks caused by subsidence would be backfilled
- topsoil would be applied to areas of SCL that have had their topsoil disturbed by subsidence
- the use of soil loss mitigation strategies during project operations and rehabilitation activities (e.g. sediment retention ponds; landforms that follow natural contours; stepped slopes that have been ripped and seeded; use of landform designs that allow natural drainage of water; stormwater management designs that reduce the velocity of water; etc.)
- rehabilitation completion criteria would be used to measure rehabilitation success against each of the

rehabilitation goals. These criteria would include: safe to humans and wildlife; non-polluting; stable; and able to achieve an agreed final land use
- a rehabilitation monitoring program that would determine whether the completion criteria for each of the rehabilitation goals have been achieved and the rehabilitation has been successful.

Topsoil fertility would be maintained in terms of seed-stock viability, healthy micro-organism populations and nutrient values by stripping different soils types according to the soil management unit (SMU) stripping depths outlined in Table 5-2.

Table 5-2 Soil management units and their stripping depths

Soil management unit	Stripping depth (cm)	Limitations
Orion/Jimbaroo	60	No limiting physiochemical properties, variable depth to parent rock
Adelong	30	Extreme pH, moderate sodium levels
Adelong/College	30	Extreme pH, sodic subsoil
Rolleston/Glengallan	10*	Moderately saline and sodic
College/Lascelles	30	Highly alkaline pH, high soluble salts and sodium
Glengallan	10*	Shallow parent material
Glen Idol	30	Alkaline
Jimbaroo	20	No limiting physiochemical properties

Source: Table 4.17 of the EIS

Table note: *The specified stripping depth is too thin for practical soil stripping and therefore, soil horizons below this SMU will inevitably be included in the stripping process

Other measures proposed by the proponent to maintain fertile topsoils for use in rehabilitation include the following:

- no stripping of topsoil during wet conditions to minimise compaction and maximise oxygen diffusion into soil stockpiles
- engineering soil stockpiles with shallow slope angles and short slope lengths to reduce soil erosion
- ripping and seeding topsoil stockpiles with a quick establishment pasture grass to limit erosion and maintain a viable seed bank for stockpiling periods greater than six months
- constructing earthen bunds and sedimentation dams downstream of the soil stockpiles to capture any eroded topsoil
- signposting topsoil stockpiles for easy identification
- weed monitoring and control.

5.2.2.2 Land degradation and contamination

The potential impacts of the project that may result in land degradation or contamination include:

- release of contaminated water and sediment to land due to dam wall failure or overtopping
- leakage of contaminated water to land due to dam pipeline failure
- soil erosion due to excess surface water run-off during flood events
- release of hydrocarbons to land due to fuel spillage or leakage
- seepage of leachate to land from spoil dumps and ROM coal stockpiles
- release of contaminated water and sediment to land from vehicle washdown bays
- release of untreated sewage from the sewage treatment plant
- spillage of coal from rail wagons during coal transport.

The measures proposed by the proponent to mitigate land degradation and contamination include:

- dam design and construction with an adequate storage allowance to accommodate most flooding situations in accordance with relevant guidelines
- annual dam inspections and implementation of remedial actions in accordance with the EA conditions
- visual inspections of dam pipelines on a regular basis

- construction of stormwater drainage and sediment dams (designed to contain a 1-in-10 year Average Recurrence Interval rainfall event) downstream of infrastructure areas, spoil dumps and coal processing infrastructure to contain any spills of contaminated stormwater run-off
- fuel/chemical dispensing and storage areas designed, constructed and bunded to the necessary standards in accordance with relevant guidelines
- spill kits available at all fuel dispensing and storage areas for rapid response and clean-up of any hydrocarbon spills or leaks
- regular maintenance of vehicles, machinery and equipment to reduce the risk of hydrocarbon leakage
- adequate design of the sewage treatment plant to cater for the maximum number of personnel that can be accommodated on-site at any one time
- notifiable activities conducted on-site will be recorded on the Environmental Management Register and a register and map of all potentially contaminated sites and any remediation details will be kept on-site and regularly updated
- spill management and emergency response plans for all hazardous materials stored on-site would be developed and implemented, as required.

5.2.2.3 Erosion and stability

Erosion and stability issues may arise in areas of the landscape affected by the project that contain soils susceptible to dispersion. Table 5-3 shows the approximate volume of topsoils available for rehabilitation.

Table 5-3 Approximate volumes of topsoil available for rehabilitation on the project site

Land management unit	Approximate surface area to be disturbed (ha)	Approximate volume available for rehabilitation (ha)
Orion/Jimbaroo	173.3	1,039,800
Adelong/College	100.8	302,400
Rolleston/Glengallan	178.9	357,800
College/Lascelles	0.2	600
Glengallan	15.0	30,000
Jimbaroo	28.4	56,800
Total:	**496.6**	**1,787,400**

Source: Table 4.18 of the EIS

The SMUs in the project area having physicochemical properties indicating that they are susceptible to dispersion under adverse conditions are as follows:

- Rolleston/Glengallen
- College/Lascelles
- Glengallan.

These three SMUs make up about 22% of the topsoil available for rehabilitation. These soils may require additional erosion minimisation measures, which are outlined below:

- clearing activities will be limited to the minimum area required for the safe operation of the site
- areas to be cleared will be surveyed, marked out and signed-off by an authorised person to avoid unplanned clearing
- run-off from undisturbed areas will be diverted around disturbed areas and stockpiles to minimise erosion
- topsoil stockpiles will be ripped and seeded with a fast growing pasture grass to stabilise these areas
- spoil dumps will be progressively rehabilitated to minimise the total area of disturbance at any one time
- spoil will be deep ripped to maximise rainfall infiltration and minimise run-off
- contour banks and sediment dams will be constructed around rehabilitated slopes to minimise slope lengths and run-off velocities and to help remove suspended sediments from run-off, prior to leaving the site.

Erosion monitoring would include establishing an annual photographic record of slope areas associated with the following landforms:

- spoil dumps
- ROM pads and product stockpiles
- embankment walls of the reject dams
- mining void walls.

Photographs will be taken following each wet season as a record of potential erosion caused by runoff. The photographs will be compared to the previous years to determine any large areas of erosion that are increasing in size and may require remedial works.

Specific monitoring of the water control dams will be undertaken to ensure the stability of the embankment walls is maintained. Regular inspections will be carried out, and instrumentation, including survey monuments, piezometers and boreholes for sampling groundwater for water quality testing, will be installed and monitored.

5.2.2.4 Landscape character, visual amenity and lighting

The existing nature of the project site is open pastures with areas of dryland, broadacre cropping on the better soils of MDL467. The landscape is made up of various components ranging from alluvial plains with creeks and swamps to gently undulating rises and low hills.

Variations in land elevation range up to 50m. There are no distinctive viewpoints, landmarks, large perennial waterways, gateways or focal points surrounding the site, and no specific features that contribute to the visual amenity of the local area. Most of the major views are associated with local homesteads and local roads, since these locations represent the most significant places in the area that are occupied or used by people.

Although the majority of vegetation is sparse, visual buffers do exist around some areas of the site. Topography and vegetation provide the main buffers for residents and visitors who are located in the north and east of the site. The visual amenity of other residences located near the northern part of the site and which are outside the project boundary would be buffered by both topography and distance from major project infrastructure.

The following matters are relevant to the project's major infrastructure and its potential to cause visual and lighting impacts during operations:

- the open-cut pit would be below ground level and its visual amenity impact would be low, except for people passing close to the pit
- surface infrastructure and associated facilities would create a moderate visual amenity impact since these structures would be visible from limited viewpoints to the south
- the MIA (e.g. workshops, offices, laboratory and water storage and treatment tanks) would not pose a significant visual amenity impact, since they would not be multi-story structures
- mine site access and haul roads would have a low visual amenity impact as they would only be visible to people who travel on or near such infrastructure
- the land subsidence associated with underground mining is expected to pose low visual amenity impacts
- out-of-pit spoil dumps will pose the greatest visual amenity impact since they will be constructed up to 90m above ground level and would be visible at the greatest distance from the site
- the train load-out facilities and rail loop are anticipated to pose limited visual amenity impacts
- the two final voids have relatively small disturbance footprints, but may have a visual impact due to the close proximity to the Capricorn Highway
- artificial lighting used during night-time operations may cause impacts at the homesteads in close proximity.

The measures proposed by the proponent to mitigate the visual amenity and lighting impacts of the project include:

- construction of a visual amenity bund parallel to the Capricorn Highway to buffer project activities and infrastructure during mining
- all existing intact vegetation buffers along the Capricorn Highway will be maintained throughout the life of the project to reduce any potential visual impacts from intermittent highway use
- constructing bunds with a minimum height of 2m around the final voids which would buffer these features from traffic on the Capricorn Highway
- the visual impacts of the project will be minimised by locating the majority of project infrastructure to the south of the Capricorn Highway, so that only one viewing direction would be affected
- progressive backfilling and rehabilitation of open-cut pits and out-of-pit spoil dumps during the first seven years of project operations to blend disturbed areas into the surrounding environment well before the end of the twenty year mine life
- using earthy or natural colours on building exteriors to help blend the structures with the surrounding natural environment

- use of directional lighting pointing away from sensitive receptors and lighting hoods to focus light sources
- selection and use of light sources with low intensity to reduce long range impacts
- dipping of vehicle headlights in areas of close proximity to sensitive locations.

5.2.3 Major issues raised in submissions

DSDIP and DNRM both requested that the proponent identify the potential impacts of the project on areas of regional interest in the Central Queensland Regional Plan as regulated under the *Regional Planning Interests Act 2014*. In response, the proponent identified an area of PAA in the north-eastern part of MDL467. The proponent stated that if the final mining lease boundary within MDL467 overlaps with an area of regional interest, a Regional Interests Development Approval (RIDA) would be sought under the *Regional Planning Interests Act 2014*. After considering the proponent's response, DSDIP noted that there is also a strategic cropping area (SCA) on MDL467 that may also be impacted by the project. EHP considers that sufficient information about areas of regional interest potentially affected by the project has been provided in the EIS, and any impacts would be assessed by the RIDA.

EHP noted that a significant amount of non-acid forming (NAF) spoil would be required to construct site infrastructure (e.g. visual amenity bund, regulated dams, flood protection levee banks, etc.) and requested the proponent to clarify whether there would be sufficient spoil available to construct this infrastructure. In response, the proponent stated that a sufficient volume of suitable construction materials could be sourced from the site, or from the proponent's limestone quarry proposed to the south of the site, to construct all site infrastructure. EHP has assessed the additional information provided by the proponent and is satisfied that a sufficient volume of competent spoil should be available for construction purposes.

EHP requested that the proponent discuss the visual amenity alternatives considered for the project and how the preferred option (visual amenity bund) would be decommissioned to achieve the rehabilitation goals of being stable and self-sustaining. In response, the proponent stated that the alternative of vegetation screening using seedlings, tube stock and mature trees was also considered. However, due to a number of factors, including the relatively high cost of planting and maintaining trees, a high failure rate of tree survival and the significant timeframe of achieving an adequate tree density and height, the earthen bund was selected as the preferred option. The proponent also stated that by the end of mine life the amenity bund would be sufficiently vegetated to be stable and self-sustaining and would have a final profile that would support a final land use of low intensity cattle grazing. The proponent also updated section 3.7 (Rehabilitation and decommissioning) of the EIS to include rehabilitation objectives, completion criteria and indicators that would be used to demonstrate that the visual amenity bund would be stable and self-sustaining. EHP was satisfied with the proponent's response and has included the proponent's commitments in the rehabilitation section of the recommended draft EA conditions provided in Appendix 1 of this report.

5.2.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to land use related aspects of the Taroborah Coal Project. The proponent has committed to applying for a RIDA if the final mining lease boundary overlaps with any areas of regional interest, including priority agricultural areas or strategic cropping areas. None of the lot on plans that underlie MDL467 are recorded on the contaminated land register or environmental management register, and no significant sources of contamination that would be impacted by the project were identified during the preliminary site investigation. The proponent's commitment to construct a visual amenity bund parallel to the Capricorn Highway would help reduce the visual impacts of the project. No Native Title rights were identified to exist over the project land.

Recommendation

If the final mining lease boundary for the Taroborah Coal Project overlaps with any areas of regional interests identified in the Central Queensland Regional Plan, the proponent should submit to DSDIP a regional interests development approval (RIDA) application under the *Regional Planning Interests Act 2014*.

5.3 Transport

Sections 4.3.1 of the EIS included a description of the existing road, rail, air and port transport infrastructure relevant to the project. Section 4.3.2 of the EIS included an assessment of the potential impacts of the project on the transport infrastructure associated with the project, as well as the mitigation measures proposed by the proponent. Appendix 11 of the EIS included a road transport impact assessment prepared in accordance with the DTMR (2006) Guidelines for Assessment of Road Impacts of Development (GARID). Appendix A of Appendix 11 of the EIS included a rail level crossing assessment prepared in accordance with the Australian level crossing assessment model (ALCAM).

5.3.1 Road infrastructure

The road assessment considered the following state-controlled and local roads and road networks:

- Capricorn Highway (Rockhampton to Alpha)
- Bruce Highway (Brisbane to Rockhampton)
- Gateway Arterial Road and Port of Brisbane Road (Brisbane)
- Anakie – Sapphire Road.

5.3.1.1 Potential impacts

The potential impacts to the road network prior to the commencement of operations would include upgrades to the following roads:

- **Capricorn Highway**—an entrance to the project site would be constructed to receive deliveries and workforce vehicles. The upgrade works would include the construction of a T-intersection, with declared turning lanes and acceleration lanes allowing traffic to enter and exit the project site safely and without impeding the flow of traffic on the highway.
- **Interior roads on MDL467**—secondary roads, including project laydown and parking areas would be constructed on the project site to provide access to major project facilities.

A stock route running northward from Lake Maraboon to the Capricorn Highway will need to be relocated approximately 3km to the west in order to accommodate the planned open-cut pit and surface infrastructure. An alternative stock route has been preliminarily approved by the DNRM's Senior Lands Officer (Stock Routes), and both the DNRM and the CHRC stock route officers will be consulted in the detailed design stage to ensure the final suitability of the relocated route.

Table 5-4 summarises the potential impacts on the road network during the initial twelve month construction period for the open-cut mine and project infrastructure, and the additional six month construction period for the underground mine in the fifth year of project operations.

Table 5-4 Vehicle movements associated with the project's construction phase

Material to be transported	Vehicle description	Origin	Total return trips
Open-cut construction phase			
Excavation and construction equipment	Six axle articulated	Mackay	26
	B Double	Mackay	18
	Six axle articulated	Gladstone	6
Diesel fuel	B Double	Gladstone	300
Imported gravel	B Double	Sapphire	1,260
Rail, ballast and bridge steel	Six axle articulated	Sapphire	44
	B Double	Sapphire	898
	B Double	Gladstone	548
Buildings, plant and services	Six axle articulated	Brisbane	100
	Six axle articulated	Gladstone	50
	B Double	Mackay	50
Structural steel and equipment	Six axle articulated	Brisbane	410
	Six axle articulated	Gladstone	206

Material to be transported	Vehicle description	Origin	Total return trips
	B Double	Mackay	204
Concrete	Four axle truck	Emerald	1,200
Excavators, haul trucks, dozers etc.	Four axle truck	Brisbane	22
	Six axle articulated	Brisbane	98
	B Double	Mackay	90
	B Double	Brisbane	4
	Double road train	Brisbane	38
Underground construction phase			
Construction equipment	Six axle articulated	Mackay	10
		Gladstone	8
Building, plant and services	Six axle articulated	Brisbane	100
	Six axle articulated	Gladstone	50
	B Double	Mackay	50
Concrete	Four axle truck	Emerald	840
Structural steel and equipment	Six axle articulated	Brisbane	100
	Six axle articulated	Gladstone	50
	B Double	Mackay	50
Total:	—	—	**7,970**

Source: Table 4.23 of the EIS

Table 5-5 summarises other potential impacts associated with the delivery of supplies required during the construction phase, including maintenance and miscellaneous supplies, personnel supplies and waste removal.

Table 5-5 Vehicle movements associated with additional supplies required during the project's construction phase

Item/s to be transported	Vehicle description	Origin	Vehicle trips (return)
Domestic and construction wastes	Four axle truck	Emerald	50
General supplies including perishables and non-perishables	Four axle truck	Emerald	52
Total:	—	—	**102**

Source: Table 4.24 of the EIS

The construction workforces will consist of 150 personnel during the open-cut construction phase and 100 personnel during the underground mine construction phase. The operational workforce would consist of up to 375 full-time staff during the combined open-cut and underground operations. The open-cut mine would be in operation for seven years during which time between 58 and 133 staff would be employed. The operational workforce for the underground mine beginning in year 5 would steadily increase, peaking at approximately 250 staff.

It is estimated that 25% of the construction and operational workforces would be sourced from the local region. An additional 50% of the construction and operational workforces would be sourced from the Mackay, Rockhampton and Gladstone regions. The remaining 25% of the workforces would fly-in-fly-out (FIFO) from Brisbane. The FIFO workforces would be transported from the Emerald airport to their accommodation in Emerald via chartered bus services arranged by the proponent. Section 5.3.3 below discusses the potential impacts of the FIFO construction and operational workforces on the air services from Brisbane.

The regional construction and operational workforces are expected to drive to and from Emerald. From Emerald, the workforces would travel along the Capricorn Highway to the project site. It is anticipated that approximately 75% of the construction and operational workforces would be transported to the mine on a BIBO basis from Emerald, while 25% are expected to drive-in-drive-out (DIDO) using personal vehicles.

Tables 5-6 and 5-7 summarise the potential road related impacts associated with transporting the construction and operational personnel to and from the project site.

Table 5-6 Construction workforce vehicle movements per year

Personnel origin and destination	Vehicle description	Frequency	Vehicle movements per year*
Emerald airport to Emerald township	Chartered bus	Twice weekly	200
	Personal vehicle	Twice weekly	200
Emerald township to project site	Chartered bus	Daily	500
	Personal vehicle	Daily	500
Total:	—	—	**1,400**

Source: Table 4.26 of the EIS

Table note: *Assumes an average of 20 working days per month, 240 days per year and 50 working weeks in a year

Table 5-7 Operational workforce vehicle movements per year

Personnel origin and destination	Vehicle description	Frequency	Vehicle movements per year*
Emerald airport to Emerald township	Chartered bus	Twice weekly	200
	Personal vehicle	Twice weekly	200
Emerald township to project site	Chartered bus	Daily	500
	Personal vehicle	Daily	500
Total:	—	—	**1,400**

Source: Table 4.28 of the EIS

Table note: *Assumes an average of 20 working days per month, 240 days per year and 50 working weeks in a year

Table 5-7 summarises the potential road related impacts during the operational phase of the project associated with the transport of diesel, bulk ammonium nitrate fuel oil and emulsion, magnetite and flocculent, water treatment and solvents, concrete, gravel and mining consumables.

Table 5-7 Annual transport of operational materials

Material to be transported	Vehicle description	Origin	Trips per year (return)
Open-cut operational phase			
Bulk ammonium nitrate fuel oil and emulsion	B Double	Gladstone	250
Diesel fuel	B Double	Gladstone	750
Lubricants, tyres and machine parts	Four axle truck	Gladstone	14
	Four axle truck	Mackay	16
	Six axle articulated	Brisbane	14
	B Double	Brisbane	16
Magnetite and flocculent chemicals	Four axle truck	Gladstone	48
Water treatment and solvent chemicals	Four axle truck	Gladstone	8
Waste haulage	Four axle truck	Emerald	200
Underground operational phase			
Diesel fuel	B Double	Gladstone	200
Consumables including roof bolts, mesh, stone dust, timber, etc.	Six axle articulated	Brisbane	50
	Six axle articulated	Gladstone	26
	Six axle articulated	Mackay	24
Concrete	Four axle truck	Emerald	200
Magnetite and flocculent chemicals	Four axle truck	Gladstone	12
	Six axle articulate	Gladstone	6
	B Double	Gladstone	6
Water treatment and solvent chemicals	Four axle truck	Gladstone	8
Gravel	B Double	Sapphire	70
Waste haulage	Four axle truck	Emerald	100
Lubricants, tyres, machine parts, conveyor belt	Four axle truck	Mackay	20
	Four axle truck	Gladstone	20
	Six axle articulate	Brisbane	20
	B Double	Brisbane	20
Total:	—	—	**4,788**

Source: Figure 4.27 of the EIS

The traffic impact assessment predicted that during the initial 12 month construction period and the production period, the most significant traffic increases and pavement impacts would occur on the Capricorn Highway between Emerald and Alpha. However, no segments of the road were predicted to experience an increase considered significant under the GARID (DTMR 2006).

Traffic generated during the initial construction phase is predicted to result in traffic increases and pavement impacts on the local road network between Anakie and Sapphire Roads, managed by CHRC.

The Capricorn Highway may be affected by fly-rock exposure during the fifth to seventh years of the open-cut operation and may require temporary closure for short periods, up to 20 times per year, in order to maintain a blasting exclusion zone.

Subsidence on the Capricorn Highway is predicted to be a one-time event, occurring over a twelve month period, and would result in a maximum subsidence of 0.9m and a maximum grade change of approximately 1.0%.

5.3.1.2 Proposed mitigation measures

The safety of road users as a result of increased project-related traffic would be maintained by implementing the following management practices:

- training in the safe use and operation of heavy vehicles and vehicles transporting over-sized loads
- construction of an intersection at the entry to the mine site approved by the relevant state and local government authorities
- implementing a fatigue management plan developed in accordance with the national heavy vehicle regulator's fatigue management guidelines (NHVR, 2013)
- transporting hazardous chemicals associated with the project in accordance with the latest version of the Australian code for the transport of dangerous goods by road and rail (National Transport Commission, 2011).

The proposed measures to mitigate subsidence impacts of the project on road infrastructure would include:

- preparation of a subsidence management plan in consultation with relevant government departments
- preparation of a compensation infrastructure agreement for subsidence of the Capricorn Highway in consultation with the DTMR.

5.3.2 Rail infrastructure

For the first part of its journey, product coal would be transported from the project site approximately 24.4km to Emerald along the existing QR Central West railway system. Trains from the project would cross approximately 14 existing level crossings from the St. Helen's road level crossing eastward through Emerald to the Nogoa junction. From the Nogoa junction, product coal would be transported along the Aurizon Blackwater rail system approximately 372km to the WICET at Gladstone.

5.3.2.1 Potential impacts

Several railway infrastructure upgrades would be required to facilitate the transport of product coal along the proposed railway route, including:

- an upgrade of the current low-grade track to 20 or 26.5 tonne axel load (TAL) between Taroborah and Nogoa Junction
- strengthening of six minor timber bridges along the Taroborah and Nogoa Junction route
- track strengthening between Nogoa Junction and Burngrove
- a major upgrade of the Nogoa River bridge, in order to achieve 20 TAL and accept wider coal wagons
- sub-projects planned along the Blackwater System as part of the Wiggins Island rail project (WIRP)
- Taroborah train-load-out and rail loop facility on the mining lease area directly south of the Capricorn Highway.

The Central West railway system would be temporarily closed daily from late 2017 to late 2018 to allow the rail upgrades for the project to be completed. The closures would be scheduled to work around the existing regular train movements each week.

A rail level crossing assessment to determine the current and projected safety of all public level crossings was undertaken for the project using the Australian Level Crossing Assessment Model (ALCAM). With the application of mitigation measures (discussed in section 5.3.2.2 below) all train crossings were determined to be within acceptable safety limits.

The Blackwater railway system is not assessed under ALCAM, as it is a privately managed, commercial railway.

An assessment of the road operational impacts associated with the rail transport of coal at the three existing railway crossing locations within the township of Emerald was also undertaken. The crossings include:

- level crossing south of the Capricorn Highway and Gregory Highway intersection
- level crossing south of the Capricorn Highway and Opal Street intersection
- level crossing south of the Capricorn Highway and Selma Road intersection.

At a train speed of 40km/hour moderate traffic delays are predicted to occur in the morning and evening peak hour traffic at the Gregory Highway crossing and evening peak hour traffic at the Opal Street crossing. Furthermore, disruption is expected to eastbound traffic through the Opal Street intersection, where the queues waiting to turn south would eventually build to the point where they exceed the capacity of the turning lane and block the single lane prior to the turning lane. The modelling indicates that the traffic congestion is predicted to clear within 90 seconds or less following the passing of the train under current intersection configurations, which is considered to be of a moderate impact. Therefore, it is likely that upgrades to the Capricorn Highway infrastructure in this area would be required to reduce the queue lengths and delays.

Subsidence on the Central West rail line is predicted to be a one-time event, occurring over a twelve month period, and would result in a maximum subsidence of approximately 0.3m and a maximum grade change (tilt) of approximately 1.0% (i.e. subsidence of 0.1m over a distance of 35m horizontally and 11m laterally).

5.3.2.2 Proposed mitigation measures

The following measures are proposed to control dust emissions during the rail transport of product coal from the project site to the WICET:

- compacting the surface of coal loaded into train wagons
- veneering the coal product.

The proposed measures to mitigate the subsidence impacts to rail infrastructure would include:

- preparation of a subsidence management plan in consultation with relevant government departments
- preparation of a compensation infrastructure agreement for subsidence of the Central West rail line in consultation with Queensland Rail.

The proponent has committed to improving safety by installing boom gates and automated signals at the new rail crossing to be constructed on the project site for the train-load-out and rail loop facility.

5.3.3 Air travel infrastructure

The Emerald airport would be used by those members of the workforce who live outside of the regional area (mostly in Brisbane) and cannot realistically drive to Emerald for their rostered periods on a regular basis. The CHRC owns and operates the Emerald airport, which is located 6km south of the Emerald town centre. The Emerald airport services approximately 166,000 passengers per year, with a total of 3,126 aircraft movements.

An upgrade to the Emerald airport is being undertaken. The upgrade would expand the aerodrome by increasing the number of aircraft bays to support regular public transport and charter, as well as freight and emergency services aircraft, upgrading the cargo bays, a designated bay and a helipad bay for the royal flying doctor service. In addition, a covered all-weather walkway for passengers is being constructed.

5.3.3.1 Potential impacts and proposed mitigation measures

It has been estimated that the project workforce movements would require approximately 100 return flights between Brisbane and Emerald per year using Dash 8 or similar capacity aircraft. This equates to two return flights per week, which would accommodate 25% of the proposed maximum workforce. The impacts of the project on the Emerald and Brisbane airports are anticipated to be negligible.

5.3.4 Port infrastructure

Construction of Stage 1 of the WICET was completed in 2014, and its export capacity of 27Mt/y has been allocated through contractual commitments to other port users. Construction of Stage 2 of the WICET is due to be completed in 2018 and would provide an additional stockpiling and ship loading capacity of 25Mt/y. The proponent proposes to rail its first load of product coal from the project site in 2018 for export. The proponent is liaising with the WICET consortium to negotiate Stage 2 capacity at the WICET for stockpiling, handling and export of up to 5Mt/y of product coal.

5.3.4.1 Potential impacts and proposed mitigation measures

The construction of the WICET was approved under a separate assessment process, which took into account the potential impacts of using the infrastructure. The proponent for the Taroborah Coal Project does not propose any additional mitigation measures.

5.3.5 Major issues raised in submissions

DTMR requested that the proponent provide information about a subsidence management plan and compensation infrastructure agreement for potential subsidence impacts on the Capricorn Highway. In response, the proponent agreed to liaise with DTMR during the development of a subsidence management plan and in relation to a compensation infrastructure agreement. Given that subsidence of the highway would not commence until at least year 7 of project operations, EHP is satisfied that there is sufficient time to complete the plan and agreement requested by DTMR.

The QFES identified potential delays of emergency vehicles at rail level crossings when responding to emergencies and incidents and requested the proponent to consider widening the road network at key locations to alleviate any delays. In response, the proponent acknowledged that delays may occur and committed to considering alternatives to widening the road network at potentially affected rail level crossings. The proponent's commitment in the EIS has been formalised in the recommendations in section 5.3.6 below, which amongst other things, requires the proponent to propose contributions to road works to alleviate traffic congestion at rail level crossings (e.g. longer turning lanes to prevent congestion of through traffic). Consequently, EHP is satisfied that potential traffic delays at rail level crossings can be adequately managed.

DTMR requested that the proponent provide further information about how road closures during blasting associated with the project would be managed to minimise impacts to freight movements and other traffic. In response, the proponent stated, amongst other things, that the public would be notified prior to the closure or diversion of any public road and a closure management plan would be prepared, including traffic management controls to ensure safety. A recommendation for the proponent to prepare a closure management plan in consultation with DTMR has been included in section 5.3.6 below. Consequently, EHP is satisfied that potential impacts of road closures can be adequately managed.

The QPS requested that the proponent consider driver fatigue of DIDO workers travelling between Emerald and their homes in regional areas, and incorporate management measures in a fatigue management plan. In response, the proponent committed to incorporating fatigue management measures, including shorter shifts at the beginning and end of roster periods and mandatory rest periods at the end of each roster, into a fatigue management plan. The requirement for the proponent to prepare a fatigue management plan has been included as a recommendation in section 5.3.6 below. Consequently, EHP is satisfied that driver fatigue of the DIDO workforce can be adequately managed.

5.3.6 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to transport related aspects of the Taroborah Coal Project. A 3km relocation of part of the stock route between Lake Maraboon and the Capricorn Highway must be approved by DNRM and CHRC. This requirement is outlined in the recommendation below. Furthermore, a number of road and rail impacts are likely to occur as a result of the project. Consequently, DTMR requires the proponent to submit: a revised road impact assessment (RIA); RMP; traffic management plans; infrastructure agreement; coal dust management plan; and a series of associated documentation for the use and management of road infrastructure associated with the project. The proponent must also obtain relevant permits and licences for the use of the state-controlled and local road networks. These requirements are outlined in the recommendations below.

Stock route recommendation

1. At least 3 months prior to the anticipated commencement of the project the proponent must obtain approval from DNRM's Senior Lands Officer (Stock Routes) and the CHRC stock route officer for the relocation of a 3km length of the stock route between Lake Maraboon and the Capricorn Highway.

Road and rail recommendations

At least 6 months prior to the commencement of significant project-related construction works[1] the proponent must:

1. submit for review a revised RIA that has been developed by an appropriately qualified person in accordance with the DTMR Guidelines for Assessment of Road Impacts of Development (2006) (GARID). The revised RIA should include:
   a. a transport generation proforma (available from DTMR's Transport system management branch in Brisbane) detailing project-related traffic and transport generation information for state and local roads
   b. a pavement impact assessment using DTMR's pavement impact assessment tools
   c. information about the assumptions and methodologies used to estimate project related traffic, where detailed estimates are not available
   d. details of the final impact mitigation proposals, listing infrastructure-based mitigation strategies, including contributions to road works, rehabilitation, maintenance and summarising key road-use management strategies, including:
      i. the proposed T-intersection south of the Capricorn Highway to allow access to the project site
      ii. the proposed road works north of the Capricorn Highway to allow access to the project site
      iii. a closure management plan to mitigate the impacts of road works and the risk of fly-rock during blasting on the Capricorn Highway
      iv. wide load vehicles travelling through the township of Emerald
      v. road works at rail level crossings to alleviate traffic congestion
      vi. a fatigue management plan to address the increased risk of worker-driver fatigue, including DIDO workers travelling between Emerald and their homes in the greater region (i.e. Rockhampton, Mackay, Gladstone etc.) before and after shift rotation.
2. submit an RMP for the project that has been prepared in accordance with the DTMR Guide to Preparing a Road-use Management Plan, including:
   a. a table listing RMP commitments providing confirmation that all works and road-use management measures have been designed and will be undertaken in accordance with all relevant DTMR standards, manuals and practices
   b. optimised project logistics and minimised road-based trips on all state-controlled and local roads.

At least 3 months prior to the commencement of significant project-related construction works:

3. formalise arrangements about transport infrastructure works, contributions and road-use management strategies required under the impact mitigation program by submitting to DTMR and any relevant local government authority an infrastructure agreement that includes the following:
   a. project-specific works and contributions required to upgrade impacted road infrastructure and vehicular access to project sites as a result of the proponent's use of state-controlled and local roads by project traffic
   b. project-specific contributions towards the cost of maintenance and rehabilitation to mitigate impacts on state-controlled and/or local road pavements or other infrastructure
   c. infrastructure works and contributions associated with shared (cumulative) use of state-controlled and local road or rail infrastructure by other projects subject to an EIS
   d. performance criteria that detail protocols for consultation about reviewing and updating project-related traffic assessments and impact mitigation measures that are based on actual traffic volume and impacts, if previously advised traffic volumes and/or predicted impacts change.
4. submit detailed drawings of any works required to mitigate the impacts of project-related traffic to DTMR and the relevant local councils for review and approval

[1] Significant project-related construction works means physical construction, including major clearing or excavation for foundations or the placement, assembly or installation of facilities or equipment at any site related to the project

5. obtain all relevant licenses and permits required under the *Transport Infrastructure Act 1994* (TI Act) for works within the state-controlled road corridor, including road works approvals (s. 33 of the TI Act), approval of location of vehicular accesses to state roads (s. 62 of the TI Act) and approval for any structures or activities to be located or carried out in a state-controlled road corridor (s. 50 of the TI Act)
6. obtain permits for any excess mass or over-dimensional loads for all phases of the project in consultation with DTMR's heavy vehicles road operation program office, and the relevant local councils in accordance with the *Transport Operations (Road Use Management) Act 1995*
7. finalise traffic management plans for the construction and commissioning of each site where road works are to be undertaken, including site access points, road intersections or other works undertaken in the state-controlled road corridor, in accordance with DTMR's Guide to Preparing a Traffic Management Plan.

In relation to the rail transport of coal along QR's Central West railway system and Aurizon's Blackwater rail system, the proponent must:

8. prepare a coal dust management plan comprising control measures to effectively mitigate dust emissions from loaded and unloaded coal haulage trains in accordance with the aims, objectives and mitigation measures specified in the Aurizon Coal Dust Management Plan (2010)
9. manage the operation of rail traffic through the township of Emerald to occur during off-peak periods only, between the hours of 9am to 2.30pm and 6pm to 6am.

5.4 Waste

Section 4.4 of the EIS provided an assessment of the type and quantity of wastes likely to be generated by the project, and the proposed management of these wastes. Tables 3.20 and 3.21 of section 3 and Table 4.32 of section 4.4 of the EIS, presented estimates of the quantity of all wastes likely to be generated by the project; the proposed waste minimisation, reuse, recycle and disposal strategy for each waste; and the potential environmental impacts associated with the waste with reference to other sections of the EIS, which addressed management of potential impacts. Section 3.6.3 of the EIS provided estimates of the volume of excavated waste and predicted characteristics of the waste based on a detailed assessment presented in Appendix 12 to the EIS. Section 3.6.4 of the EIS provided estimates of the volume of reject material from the coal processing plant and outlined proposed storage and containment of rejects, including design criteria.

5.4.1 Waste streams generated by the project

Table 5-8 provides a summary of the waste streams, estimated volumes and proposed treatment methods of the waste materials likely to be generated by the project.

Table 5-8 Waste streams, quantities and treatment methods

Waste type	Estimated waste quantities	Preferred re-use, recycling, disposal option
Excavated waste (waste rock or spoil)	Estimated annual average quantity up to 22 million loose cubic metres (lcm)	Disposal in out-of-pit spoil dumps (mainly years 1 and 2)
Coarse and fine coal from the CHPP	Annual maximum 33 million lcm	In-pit dumping year 3 onwards
Cleared vegetation	Estimated annual average quantity up to 212,000 tonnes (t)	Mulch, landscape borders, fence posts, natural habitat for rehabilitation
General waste	Annual maximum 280,000 t	Re-use or recycle where appropriate
Scrap Metal	Estimated annual average quantity up to 36,000 t	Non-recyclable material stored in bins and collected by a licensed waste management contractor
Batteries	Annual maximum 72,000 t	Re-use or landfill (off-site or on-site)
Hydrocarbon and chemical drums	1000m^3 during construction	Stockpiled less than 3m high and 200m^2 area and at least 10m from other tyre storage area pending collection by licensed waste management contractor.

Waste type	Estimated waste quantities	Preferred re-use, recycling, disposal option
Tyres	20 tyres per annum	Removal by licensed waste management contractor during initial construction
Sewage	Up to 5ML per annum during construction	On-site treatment and spray irrigation
Mine affected water	Up to 10.15ML per annum during operations	Used in CHPP. Process water stored in recycled water dam and re-used.
Groundwater	Average of 2400ML per annum	Temporarily stored in the mine water dam, prior to recycling
Waste oils, hydrocarbons and solvents	220ML to 2100ML per annum	Waste oils etc. would be collected and stored in clearly marked containers for recycling

Source: Table 4.32 of the EIS

5.4.1.1 Excavated waste and wash plant rejects characterisation

An estimated annual average quantity of up to 22M loose cubic metres (lcm) of excavated waste would be produced. Over the life of the mine, the total volume of excavated waste from open-cut activities (i.e. overburden and interburden) was expected to be approximately 159M lcm. An annual average of up to 212,000t of wash plant rejects would be produced by proposed open-cut operations and 36,000t by underground longwall operations.

Excavated waste characterisation was based on two sampling programmes detailed in Appendix 12 to the EIS. The sampling was considered sufficient to estimate the relative proportion of geochemical material types for the purposes of planning, with further testing required to better delineate potential acid forming (PAF) horizons and reduce the volume of material requiring special handling. Results indicated that approximately two thirds of the overburden and interburden tested would likely be NAF, and one third PAF or PAF low capacity (PAF-LC). Wash plant wastes and ROM coal were determined likely to be mainly PAF with ROM coal from A and B seams (the main target seams), and coarse and fine rejects from A and B seam tops, having a high acid mine drainage (AMD) risk and the potential to rapidly release high acid and metal or metalloid contaminants. The results did not indicate a potential for alkaline mine drainage.

The characteristics of overburden and interburden determined by geochemical testing of samples from exploration boreholes are summarised in Table 5-9 below.

Table 5-9 Geochemical classification of materials to be mined

Material source	Number of samples	AMD category		
		NAF (%)	PAF-LC (%)	PAF (%)
Weathered Basalt	10	100	0	0
Weathered Sedimentary Rock	71	100	0	0
Fresh A Seam Overburden	78	40	40	20
Fresh A Seam	3	0	0	100
Fresh A-B Seam Interburden	70	29	44	27
Fresh B Seam	12	0	0	100
Fresh B Seam Floor	9	14	72	14

Source: Table 4.33 of the EIS

5.4.2 Potential impacts and proposed mitigation measures

The EIS highlighted the following potential impacts from waste streams associated with the project:

- contamination of land, surface water and groundwater as a result of contaminated runoff or seepage from:
    - the open-cut pit, spoil dumps, ROM and product coal stockpiles, and processing areas
    - waste storage areas
    - sewage
    - spillage of waste chemicals, fuel or oil
    - impacts on visual amenity due to the size of out-of-pit spoil dumps and general waste storage
    - attraction of scavenging fauna, including feral cats, foxes, scavenging birds and rodents
    - greenhouse gas emissions.

General waste would be disposed off-site, and tyres would be recycled or disposed off-site, or possibly buried on-site.

Sewage would be treated on-site to produce Class A effluent quality, as defined by the Queensland Water Recycling Guidelines (2005), and disposed of by irrigation to land within the project area.

Waste water from the coal processing plant would be stored in a dam (designed in accordance with EHP (2012) Guideline EM635 - Manual for Assessing Hazard Categories and Hydraulic Performance of Dams), and reused for coal washing.

Cleaner production strategies were proposed to be implemented in project design wherever possible, including:

- a site water management system with maximum possible recycling of water (refer EIS section 4.5.2.3)
- a waste minimisation plan based on the waste management hierarchy (avoid, reuse, recycle, disposal)
- a greenhouse gas (GHG) management plan focused on energy use efficiency
- minimisation of vehicle emissions.

Excavated waste would be backfilled in-pit as mining progresses and disposed of within three out-of-pit spoil dumps proposed to be located around the western and south-western edge of the open-cut pit. Investigations would be conducted in the mine infrastructure area to identify materials with geotechnical properties suitable for constructing the spoil dumps.

PAF material in the overburden and interburden would be disposed of as follows:

- out-of-pit spoil dumps would be constructed using NAF material where possible
- material would be screened for AMD potential and selectively handled to isolate PAF material
- PAF materials would be preferentially placed in-pit below the groundwater recovery level in order to facilitate inundation and limit long-term oxidation after mining has finished
- PAF material would be compacted in lifts of 5m or less to minimise material oxidation
- prior to inundation, the lifts and faces of placed PAF material would be treated where necessary with crushed limestone
- PAF material placed in-pit above the final groundwater recovery level would include a thick outer layer of NAF material (preferably high ANC) and may also be internally sealed to limit oxygen transfer and fluctuating moisture content
- PAF material placed in out-of-pit spoil dumps would be set back from the face of the dump and compacted during dumping to limit oxidation
- the base of out-of-pit spoil dumps would be constructed with at least a 1m deep layer of NAF material to limit the exposure of PAF material to water flowing along the interface between the dump and the natural ground level
- ANC materials would be blended with PAF and PAF-LC material to increase lag times before the onset of acid forming conditions
- further trials and kinetic testing would be undertaken to confirm the AMD management strategy.

Dewatered coarse and fine rejects would be combined and disposed of initially in the south-west and south-east out-of-pit spoil dumps, then placed in the pit when backfilling of the open-cut pit starts. An estimated 1.2 million lcm of rejects would need disposal over the life of the project. Purpose-built rejects isolation cells would be constructed, consisting of a 50mm thick geosynthetic clay liner (GCL) along the base, side walls and as a capping to restrict oxygen ingress and seepage.

Monitoring of seepage and run-off from open-cut pit walls and floors, ROM stockpiles, product coal stockpiles, spoil dumps and rejects storage areas would be undertaken to assess the performance of on-site waste rock management strategies, assess on-site water quality, and check whether changes are needed to the strategies.

The proposed rehabilitation strategy for in-pit and out-of-pit spoil dumps would reduce hydraulic conductivity, prevent capillary movement of moisture, and encourage the growth of vegetation suitable for the final land use. The rehabilitation strategy includes the following measures:

- constructing a NAF/ANC waste layer to encapsulate PAF waste to reduce the generation of AMD
- a 0.5m thick clay capping to limit water ingress and reduce the volume of water draining through the spoil dump
- a 0.4m thick capillary break layer (gravel) installed either side of the clay layer to prevent capillary movement of moisture
- a vegetative layer including hardy local native species to reduce soil erosion, minimise visual amenity impacts, and facilitate water evaporation from surface soils.

5.4.3 Major issues raised in submissions

EHP requested that Table 4.33 (Geochemical classification of materials to be mined) and section 3.6.3.4 (Acid generation) be amended to include the estimated volume of each waste rock unit having NAF and PAF properties, and that this information be used to amend the proposed design of the in-pit and out-of-pit waste rock dumps, if necessary. In response, the proponent provided further information to clarify the basis for estimates of the proportion of NAF and PAF in the waste rock, and the assumptions used in design of the in-pit and out-of-pit waste rock dumps. Table 3.24 of the EIS was amended to clarify the basis for the estimates and to better illustrate the amount of overburden material that is likely to be NAF or PAF as follows:

Table 5-9 The number of samples per volume of waste rock units

Waste rock unit	Estimated volume (m^3)	Number of samples
Weathered NAF – Low ANC	40,700,000	43
Weathered NAF – High ANC	9,400,000	38
Fresh NAF	18,400,000	26
Subtotal - NAF	**68,500,000**	**107**
Fresh PAF-LC	18,400,000	26
Fresh PAF A Seam Roof	22,400,000	26
PAF/PAF-LC Interburden	17,600,000	70
Subtotal – PAF and PAF-LC	**58,400,000**	**122**

Source: Table 3.24 of the EIS

EHP assessed the additional information and determined that the number of samples was generally proportional to the estimated volume of each waste rock unit. Consequently, the additional information was deemed adequate at this stage. However, additional sampling during mining, as outlined in the proposed mitigation measures and included in the recommended draft EA conditions in Appendix 1, would be required to further characterise the geochemical properties of the waste rock.

EHP requested the proponent to assess the hydraulic and nutrient loading characteristics of the proposed 2.5ha effluent irrigation area in accordance with the procedure outlined in the Model for effluent disposal using land irrigation (MEDLI, National Program for Sustainable Irrigation 1996). In response, the proponent followed the MEDLI procedure and calculated that, using class A treated water, an irrigation area of 0.9ha would be required at the proposed irrigation rate of 2.6mm per day to ensure no detrimental nutrient or salt impacts. Based on the additional information provided by the proponent, EHP is satisfied that the proposed irrigation area of 2.5ha would be more than sufficient to accept the volume of recycled water produced by the sewage treatment plant.

EHP and CHRC raised concerns that the Emerald landfill may not have sufficient capacity to accept the estimated volumes of general waste over the life of the project, and EHP requested a discussion of alternative disposal options if the landfill did have insufficient capacity. In response, the proponent advised that there would be potential for the annual waste volume to exceed the CHRC Emerald landfill capacity and proposed to work with CHRC on solutions, including disposal of waste within the project open-cut pit. However, EHP does not generally support the in-pit disposal of wastes and the proponent would need to provide additional information for EHP to consider authorising this activity under the EA for the project.

EHP identified that section 3.6.3.1 of the EIS stated that the overburden and interburden wastes were expected to swell by a factor of 25% following excavation. However, the typical spoil dump design parameters in Table 3.23 of EIS were based on a swell factor of 20%. EHP noted that the discrepancy in the swell factor could significantly alter the height and footprint of the waste rock dumps with implications for successful rehabilitation and final landform design. In response, the proponent confirmed that a 25% swell factor had been used as the basis for spoil dump design and amended Table 3.23 accordingly. Based on the additional information, EHP is satisfied that the proponent has applied an appropriate swell factor for the design and rehabilitation of the final landform.

DNRM and EHP requested details of the quantities and sources of extractive materials required for decommissioning of the out-of-pit spoil dumps, and DNRM also requested discussion on the effect of project demands on regional reserves of these materials. In response, the proponent provided preliminary estimates of gravel, clay, limestone and other extractive materials required for construction and decommissioning of the spoil dumps and indicated the all materials required were expected to be available within the planned open-cut excavation areas or in an adjacent mineral lease controlled by the proponent. DNRM did not request any further clarification in relation to this issue and EHP is satisfied that the proponent has provided sufficient evidence to support the proposed rehabilitation and decommissioning of the spoil dumps.

EHP noted that Table 4.32 of the EIS did not include cleared vegetation as project waste and that the proposed burning of cleared vegetation was not considered to be best practice. In response, the proponent provided, amongst other things, an amended Table 4.32 that included cleared vegetation as a waste stream and proposed measures for reuse as the preferred treatment. Condition C3 in section 6 of the EIS was amended to indicate the burning of waste vegetation would be a last resort. EHP does not support burning vegetation as a management practice, and would not consider authorising the activity without a standard operating procedure (which has not been provided by the proponent). Consequently, the recommended draft EA conditions would not permit burning vegetation on the mining lease.

5.4.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the TOR for the assessment of the wastes likely to be generated by the project, the potential environmental impacts associated with those wastes, and the appropriate strategies for dealing with each waste stream.

The waste rock (overburden and interburden), ROM coal, and rejects from the CHPP, present a high risk of AMD unless managed appropriately. The measures stated in the EIS are considered adequate to prevent significant risk from AMD, although further geochemical testing and refinement of management measures will be required during the detailed design and operational phases of the project. EHP's model mining conditions for waste rock are considered adequate to address the risks of excavated wastes from the project and have been included in the waste management schedule of the recommended draft EA conditions contained in Appendix 1 of this report. Additional waste management requirements are outlined in the recommendations below.

Recommendation 1

The proponent should continue to liaise with CHRC about disposal of project wastes at the Emerald landfill.

Recommendation 2

The proponent should consult with EHP about whether there are any waste streams from the project that would be suitable for disposal within the open-cut pit.

5.5 Water

Section 4.5 of the EIS contained an assessment of the impacts of the project on surface water and groundwater resources. A description of the existing surface water and groundwater values was provided in section 4.5.1. The potential impacts on surface water and groundwater values, as well as the proposed mitigation and management measures were provided in section 4.5.2. Additional supporting information was provided in Appendix 13, Surface water management plan, and Appendix 14, Groundwater impact assessment.

5.5.1 Existing environmental values

5.5.1.1 Existing surface water hydrology

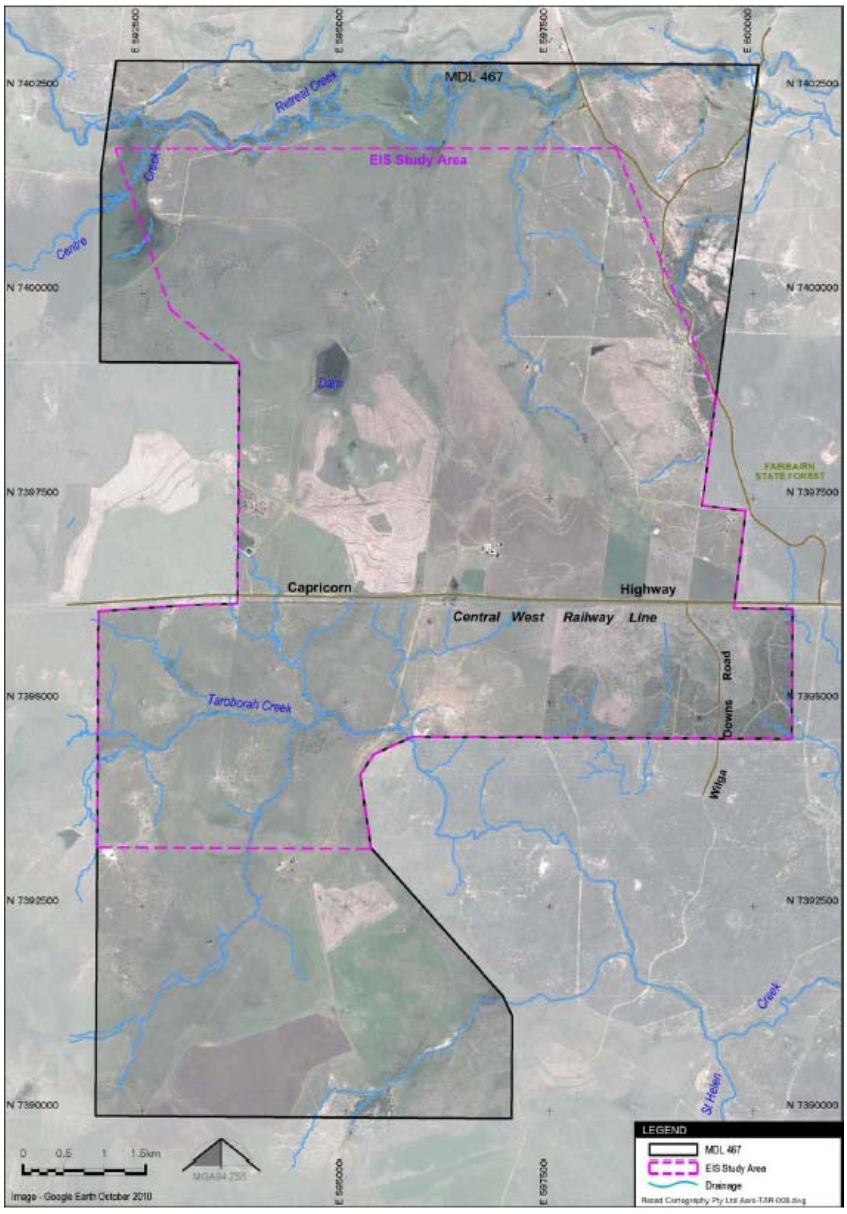
The Taroborah Coal Project is located within the Fitzroy River Basin, which has a total catchment area of approximately 142,600km^2. The Taroborah Coal Project is located in the lower Nogoa and Theresa Creek sub-basin. The major drainage features within the project site that are defined as watercourses under the *Water Act 2000* are identified in Figure 5-1, and include the following:

- Retreat Creek, which flows west to east across the north of the project site into Theresa Creek, before

joining the Nogoa River
- Centre Creek, which originates to the west of MDL467 and discharges into Retreat Creek in the north-west corner of the project site
- Taroborah Creek, which is located in the south of the project site and flows in an east to south-easterly direction into St. Helens Creek, which then flows into the Nogoa River.

Lake Maraboon and Fairbairn Dam are located 5km to the south of the project site. Lake Maraboon discharges to the Nogoa River and provides water to approximately 300 irrigators who farm in the Emerald area. However, the Taroborah Coal Project is located downstream of the catchment area for Lake Maraboon, and will not impact on it.

Figure 5-1 Surface water drainage features on the project site



Source: Figure 4.61 of the EIS

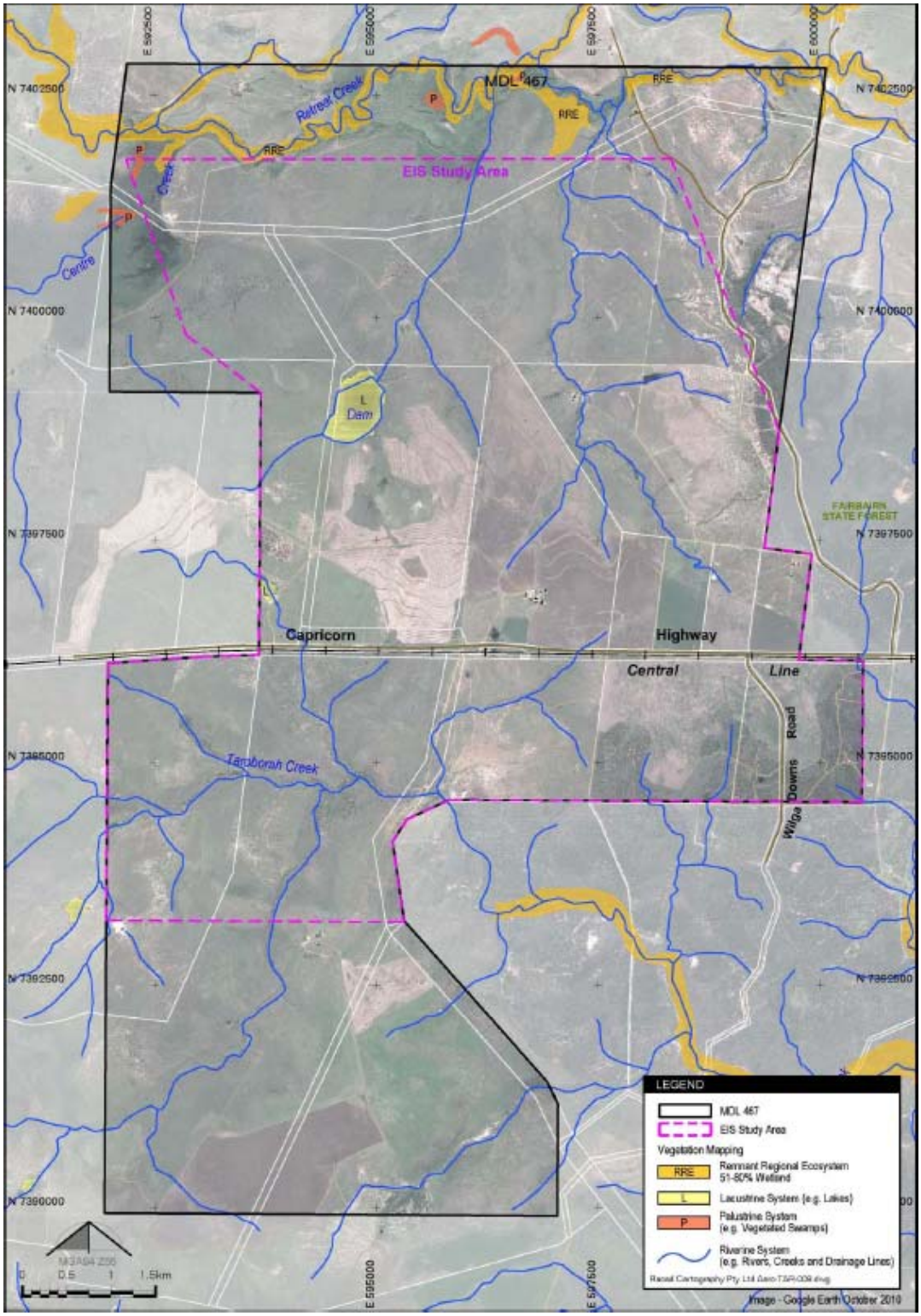
5.5.1.2 Wetlands

The major wetland features within the project site are highlighted in Figure 5-2 and include the following:

- remnant regional ecosystem (RE) consisting of 51% to 80% wetland along Retreat Creek
- lacustrine dam located in the west central portion of the project site
- limited areas of palustrine wetlands to the north and north-west of the project site.

Wetland systems on the site were assessed to have moderate to good aquatic habitat quality, and were considered to be important as permanent and semi-permanent water sources in a region characterised by ephemeral watercourses.

Figure 5-2 Wetland features of the Taroborah Coal Project site



Source: Figure 4.62 of the EIS

Lacustrine wetlands

Two lacustrine wetlands (in the form of artificially created dams) were identified on the project site. The larger dam in the central west of the project site is the only source of permanent water on-site and was found to support substantial and complex habitat for fauna, with an abundance of vegetation both in and surrounding the dam providing evidence of little erosion. This dam was scored as medium under the Aquatic Conservation Assessment (ACA) process. The smaller dam is located on a drainage line of Taroborah Creek near the Capricorn Highway. This dam was mapped during the field survey, but does not have permanent water and was not scored under the ACA process.

Palustrine wetlands

One large, ephemeral palustrine wetland was identified in the north-west of the project site, incorporating two smaller palustrine wetlands. The two small palustrine wetlands were scored as medium under the ACA process. During the dry season survey, only a small quantity of water was evident. However, the wetland was found to support good aquatic habitat, evidenced by the variation in substrate and cover elements. The banks of the wetland were dominated by grass species.

Regional ecosystems associated with wetlands

Some vegetation communities on the project site were noted for their potential to use groundwater. Measured groundwater levels in the vicinity of Retreat and Taroborah Creeks are approximately 6m–10m below ground level. That depth is shallow enough for deep-rooted vegetation species, such as eucalypt species, to have the potential to access and use the sub-surface groundwater. Refer to section 5.8 of this report for further information.

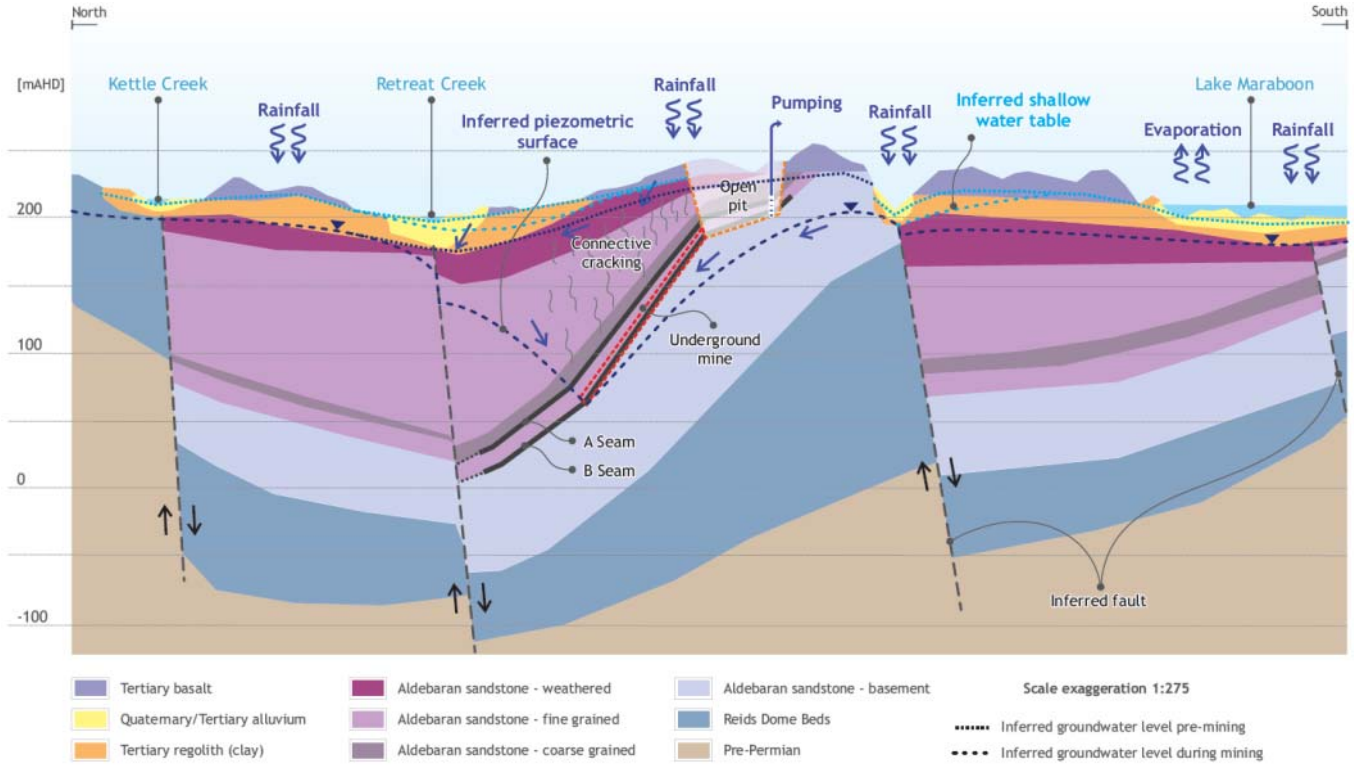
5.5.1.3 Groundwater regime

The three major geological units and their characteristics within the project area are described below:

1. Quaternary alluvium consists of a cover, less than 30m thick, of alluvial and colluvial sediments deposited across much of the western and northern portions of the project area. The alluvial cover, where encountered, generally comprises less than 25m of poorly consolidated clays, silts, sands and gravels. The alluvial deposits unconformably overlie Tertiary basalt and sediments. Where the Tertiary geology is absent, the Quaternary alluvium and colluvium directly overlie the Permian Aldebaran sandstone. The typical depth of groundwater in the alluvium is generally less than 10m below ground level. However, no users of alluvial groundwater were identified in the project area. The alluvium is generally a losing system and stored water is likely to discharge as leakage to nearby sub-cropping Tertiary and Permian units
2. Tertiary basalt and sediments outcrop throughout much of the middle and southern portions of the project area. The occurrence of fresh basalt is sporadic, and where encountered, is generally less than 30m thick. Fresh basalt is generally underlain by highly weathered Tertiary clays and sands, and occasionally by silts and gravels that range in thickness from 30m to 90m. Furthermore, the weathered clays and sands progressively grade into weathered Permian deposits beneath. Fractured rock aquifers in Tertiary basalts are predominantly used by landholders located to the west of the project area and by one landholder within the project area. Tertiary units are likely to be confined and hydraulically disconnected from the underlying Aldebaran Sandstone. Groundwater flow within the Tertiary is towards the east and north-east within the project area and surrounds, which suggests that the main source of recharge to the Tertiary is from rainfall percolation in the sub-crop areas to the west and south-west of the project area. Discharge from Tertiary sediments is likely to occur as lateral flow down-gradient of the project area. Leakage to underlying units may also occur where impermeable Tertiary clays are absent in the geological profile.
3. Permian Aldebaran sandstone sub-crops throughout the central and northern areas of the project area and is predominantly composed of quartzose sandstone deposited during cyclic marine to fluvial-deltaic environments, and is interbedded with conglomerate, shale, siltstone and coal. Below the base of weathering, strata are dominated by fine to very fine grained sandstones with occasional medium grained horizons deposited during a marine transgression. This fine grained sandstone is up to 150m thick in the northern portion of the project area, but has been removed by erosion in the south, where outcropping granite is present. Groundwater appears to be present under confined conditions throughout the Aldebaran Sandstone. A total of six of the 22 landholder bores identified within 10km of the project area target groundwater within the Aldebaran Sandstone. The main water bearing unit within the project area is the pebbly, coarse grained sandstone that lies directly on top of the ‘A’ coal seam. Recharge predominantly occurs through more permeable zones within the regolith and tertiary basalt, as well as downward percolation from quaternary alluvium associated with Retreat Creek.

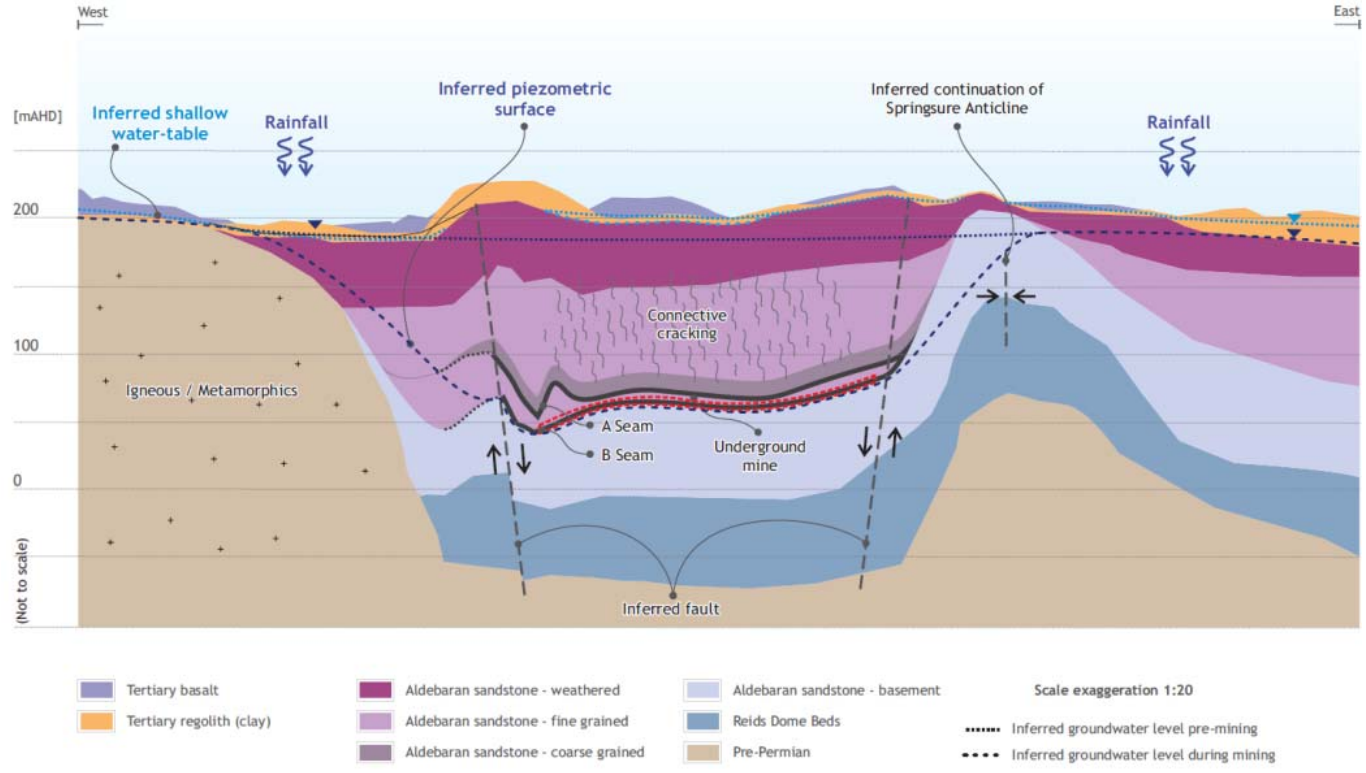
A geological conceptualisation of the groundwater regime in the vicinity of the project is shown in Figures 5-3 and 5-4 below.

Figure 5-3 Conceptual north to south geological cross-section of the project site



Source: Figure 16 of Appendix 14 of the EIS

Figure 5-4 Conceptual west to east geological cross-section of the project site



Source: Figure 17 of Appendix 14 of the EIS

5.5.1.4 Surface water quality

Background surface water quality at some locations around the project site was not always below, or within the range of, applicable water quality objectives (WQOs) or trigger values.

With regard to salinity levels in Retreat Creek and its tributaries, the average water quality results ranged from 768µS/cm to 2,302µS/cm. With regard to salinity levels in Taroborah Creek and its tributaries, the average water quality results ranged from 988µS/cm to 2,285µS/cm. All salinity results at all sites in Retreat and Taroborah Creeks exceeded the base flow salinity aquatic ecosystem protection WQO of 340µS/cm for the Lower Nogoa and Theresa Creek sub-basin specified in the Queensland Water Quality Guidelines.

With regard to other physio-chemical parameters in Retreat Creek, the mean pH at one site (9.04) and dissolved oxygen at three sites (74.73%, 57.15% and 72.2%) fell outside the ranges of both the Lower Nogoa and Theresa Creek trigger values and the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of pH 6.5 to 8.5 and 85% to 110% dissolved oxygen. Mean measurements of turbidity (476NTU, 907NTU, 419NTU and 1430NTU) at four sites exceeded the Lower Nogoa and Theresa Creek trigger values of 50NTU. The mean of 1430NTU at one site in Retreat Creek also exceeded the ANZECC (2000) Livestock Drinking Water Guidelines of 1000 NTU. Mean concentrations of total phosphorus (0.17mg/L, 0.31mg/L, 0.19mg/L and 0.11mg/L) at four sites, sulfate at one site (54mg/L), and nitrate at a different site (0.12mg/L) exceeded the Lower Nogoa and Theresa Creek trigger values of 0.05mg/L, 25mg/L and 0.06mg/L respectively.

With regard to heavy metals in Retreat Creek, mean dissolved concentrations of copper (0.002mg/L and 0.003mg/L) and silver (0.00010mg/L and 0.0004mg/L) at two sites, and zinc (0.009mg/L) at one site, exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of 0.0014mg/L, 0.00005mg/L and 0.008mg/L respectively.

With regard to other physio-chemical parameters in Taroborah Creek, the mean pH (8.66 and 8.89) and dissolved oxygen (67.40% and 140.16%) at two sites, fell outside the ranges of both the Lower Nogoa and Theresa Creek trigger values and the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of pH 6.5 to 8.5 and 85% to 110% dissolved oxygen. Mean measurements of turbidity (432NTU and 919NTU), nitrite (0.18mg/L and 0.07mg/L), nitrate (1.71mg/L and 0.35mg/L), total nitrogen (0.7mg/L and 4.07mg/L) and total phosphorus (0.10mg/L and 0.75mg/L) at two sites, exceeded the Lower Nogoa and Theresa Creek trigger values of 50NTU, 0.06mg/L, 0.06mg/L, 0.5mg/L and 0.05mg/L respectively. The mean concentration of total phosphorus (0.75mg/L) at one site also exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQO of 0.5mg/L. The mean concentration of sulfate (30.14mg/L) at one site also exceeded the Lower Nogoa and Theresa Creek trigger value of 25mg/L.

With regard to heavy metals in Taroborah Creek, mean dissolved concentrations of copper (0.002mg/L and 0.005mg/L) at two sites, and silver (0.0004mg/L) at one site exceeded the ANZECC (2000) Aquatic Ecosystem 95% species protection WQOs of 0.0014mg/L and 0.00005mg/L respectively.

5.5.1.5 Groundwater quality

Groundwater at the site is slightly brackish. The average recorded values for salinity (measured as conductance) in the Alderbaran sandstone geology are 1,435µS/cm in the course-grained sandstone, 1,765µS/cm in the fine-grained sandstone, and 2,301µS/cm in the coal measures. The average recorded values for salinity in the Tertiary geology are 2,059µS/cm and 1,354µS/cm in the Tertiary regolith and Tertiary basalt respectively. The average recorded values for salinity in the alluvium is 1,430µS/cm. Salinity of the coal seams is comparatively low for the Bowen Basin, which typically ranges from 5,000µS/cm to 50,000µS/cm. The lower salinity in the coal seams is likely related to leakage of fresher groundwater from the immediately overlying pebbly coarse sandstone unit, and from rainfall infiltration where it sub-crops to the south.

A significant number of salinity samples exceeded the 80th percentile limit specified for deep (>30m) groundwater quality objectives for the Nogoa River and all waters of the Nogoa River sub-basin, listed under the Environmental Protection (Water) Policy 2009. Major ion exceedences included sodium, calcium, magnesium, bicarbonate, chloride and sulfate. A number of minor ions and metals also exceed the groundwater quality objectives.

Comparison of the data against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000) for irrigation indicates that groundwater collected from most of the monitoring bores is suitable for short term irrigation.

Comparison of the data against the Australian Drinking Water Guidelines 2011 (NRMMC, 2011) (ADWG) show that in general all of the groundwater tested is not suitable for human consumption because it exceeds either the aesthetic or health guidelines. All bores exceeded, or fell outside the range of, the ADWG health guidelines for at least two criteria, including total dissolved solids, pH, total hardness, chloride, sodium, sulfate, aluminium, iron, and manganese. All bores exceeded the ADWG aesthetic guidelines for smell, taste, and appearance.

5.5.2 Potential impacts

5.5.2.1 Surface water impacts

The potential impacts of the project on surface water would include the following:

- aquifer dewatering associated with open-cut and underground coal mining activities
- permanent alteration (e.g. due to final void and out-of-pit spoil dumps) of the direction and quantity of surface drainage south of the Capricorn Highway
- temporary alteration of the direction and quantity of surface drainage north of the Capricorn Highway due to subsidence of the land surface associated with underground mining.

5.5.2.2 Cumulative surface water impacts

A study conducted by EHP in 2009 investigated the cumulative impacts of mining activities on water quality in the Fitzroy River Basin. The study determined that salinity presents the most significant risk to water quality in the Basin due to discharges of mine-affected water from coal mines. The proponent referred to the EHP study in the EIS for the Taroborah Coal Project and concluded that the project would not pose a significant cumulative impact from controlled or uncontrolled releases, due to the following reasons:

- the EHP investigation of cumulative surface water impacts found that a number of mines in the northern Isaac-Connors sub-catchment posed the greatest risk of cumulative impacts in the Fitzroy Basin
- the investigation found that all of the mines (with the exception of Ensham mine) in the southern sub-catchments (i.e. Dawson, Nogoa and Mackenzie river systems) posed a low risk to cumulative water quality impacts
- the Taroborah Coal Project would be located in the Nogoa River sub-catchment, which was found by the EHP study to be in a low risk catchment for cumulative surface water impacts
- no operating mines exist upstream of the project and the nearest downstream operating mine is Ensham, which is located 60km to the east
- the EHP's Fitzroy Basin model water conditions would be applied to the environmental authority for the project, and those conditions were specifically developed to prevent the cumulative impacts of multiple mine discharges on the downstream surface water environment
- the Taroborah Coal Project is expected to require controlled discharges of less than 100ML/y with a salinity concentration below 2,500µS/cm.
- discharges would be undertaken in accordance with the model water conditions which would include minimum flow requirements, discharge limits and trigger investigation levels developed with regard to the spatial location of the project within the sub-catchment.

5.5.2.3 Groundwater impacts

A three-dimensional numerical simulation of groundwater flow for the project was run for the 21 year life of the mine to, amongst other things, predict the zone of depressurisation in alluvial and other aquifers, and predict changes in the groundwater regime. The model predicts that the Taroborah Coal Project would result in the following impacts:

- an average groundwater inflow rate to mine workings of 2.6 megalitres per day (ML/day), peaking at 5.7ML/day at around year 19
- groundwater level drawdown within the alluvium extending up to 3.5km east of the MDL467 boundary
- groundwater level drawdown within the Tertiary basalt extending up to 3km south of the boundary of MDL467 resulting in drawdown on two known bores of up to 1m, and seven bores of over 2m
- gradual recovery of groundwater levels to 194m Australian Height Datum (AHD) and 190m AHD for the western and eastern pit voids respectively, with both pit lake levels well below the pit crest.

5.5.2.4 Cumulative groundwater impacts

With regard to potential cumulative groundwater impacts, the nearest proposed coal mine is the Teresa Coal Project, which if developed would be located approximately 19km to the north of the Taroborah Coal Project MDL467 boundary. Based on the findings of the EIS for the Teresa Coal Project, the worst-case modelled drawdown is predicted to extend 2.5km to the north and west of the project boundary and 10km to the south and south-east of the project boundary. Groundwater drawdown for the Taroborah Coal Project is predicted to extend up to 3.5km outside of the project boundary. Given the two project boundaries are approximately 19km apart, there should be no overlap of impacts, and the Teresa and Taroborah Coal Projects may each be considered in isolation rather than having a cumulative impact on the groundwater aquifer.

5.5.3 Proposed mitigation measures

Measures proposed to mitigate the impacts of the project on surface and groundwater resources include:

- construction activities that affect stormwater flow paths would commence only after suitable stormwater management infrastructure has been established
- clearing of vegetation would be undertaken in a staged manner to minimise the disturbance footprint at any one time
- stabilisation of disturbed areas would be undertaken as soon as practicable after disturbance
- the majority of the current surface water drainage patterns disturbed in open-cut areas would be rehabilitated
- ongoing surface and groundwater monitoring in accordance with the requirements specified in the water management plan for the project.

5.5.4 Major issues raised in submissions

DNRM and SunWater requested the proponent to provide further information about the proposed beneficial use of excess mine water, including the piping and pumping infrastructure required to transfer water from the mine to the proposed release location in the Selma irrigation channel. In response, the proponent stated that a 100kW pumping station would be installed at the mine site and a 250mm diameter water pipeline capable of transferring up to 5ML/day would be constructed parallel to the Central West railway line. DNRM and SunWater were satisfied with the additional information provided by the proponent, subject to pre-approval consultation with the relevant parties (refer to the recommendation in section 5.5.5 below).

DNRM requested the proponent to provide any additional groundwater monitoring data that was collected after April 2013 (i.e. any new data since the EIS was released for public notification) to identify any trends or seasonal variation in groundwater level and quality, and determine whether the groundwater model requires recalibration. In response, the proponent provided additional data collected in May and September 2014. The proponent's analysis of the data indicated that there were no significant changes in groundwater levels recorded between April 2013 and September 2014, and water quality was generally within 10% of the April 2013 dataset. The proponent concluded that the additional monitoring results indicate that there is little seasonal variation in the groundwater regime, which validates the assumptions used in the groundwater model. However, groundwater quality and levels would continue to be monitored in accordance with the proposed groundwater monitoring program. DNRM considered the proponent’s response, but determined that a minimum of 12 consecutive months of groundwater level and quality data would be required to support the proponent’s conclusions. DNRM recommended that a peer review of the groundwater model be undertaken, and that an ongoing transient calibration of the groundwater model be conducted once additional permeability, groundwater levels and baseflow data is available. DNRM recommended that the groundwater model be reviewed and recalibrated no later than 3 years after dewatering commences. EHP has incorporated the DNRM recommendations in the recommended draft EA conditions for the project.

DNRM requested the proponent to outline any mitigation measures to address the potential impacts of the project on neighbouring groundwater bores. In response, the proponent proposed to enter into make good agreements with potentially affected landholders, and either deepen any affected bores, or provide an alternative supply from the mine dewatering scheme. EHP is of the opinion that the proposed mitigation measures are consistent with the legislative requirements under the *Water Act 2000* and the EP Act and would satisfactorily mitigate impacts on neighbouring groundwater users.

EHP referred the proponent to Section 52 of the Environmental Protection Regulation 2008 that requires adequate buffer zones between site activity and sensitive areas, commenting that while the proponent had proposed an adequate buffer to Retreat Creek, they had not proposed buffers to the wetlands or other riparian areas. In response to this issue, the proponent committed to provide 50m buffers to sensitive aquatic ecosystems. EHP is satisfied that the buffer distance would be adequate for protecting the sensitive areas of the site.

5.5.5 Conclusions and recommended conditions

The EIS used adequate studies, survey methodology, and survey effort to assess potential impacts on surface water and groundwater resources. The mitigation and management measures proposed by the proponent are considered adequate to manage potential impacts during the life of the project. The proponent’s commitments in the EIS to undertake ongoing monitoring programs during the life of the Taroborah Coal Project are reflected in the recommended draft EA conditions included in Appendix 1 of this report.

The surface and groundwater monitoring programs proposed to be carried out by the proponent during the life of the project are considered adequate to identify the potential impacts of the project on the surface and groundwater resources. Conditions to manage surface water and groundwater resources have been included in the recommended draft EA conditions contained in Appendix 1 of this report. Conditions about conducting a peer

review, and recalibration of the groundwater model have also been included in Schedule E, Groundwater, of the recommended draft EA conditions contained in Appendix 1.

With regard to the potential beneficial use of mine affected water, the following action is recommended:

Recommendation

Contact DNRM, EHP and SunWater for pre-approval advice about the proposed release of excess mine water for beneficial use in the Selma irrigation channel.

5.6 Air

Section 4.6 of the EIS discussed the air quality aspects of the project. Section 4.6.1 of the EIS included a description of the environmental values, including the existing air quality in the area and the proximity of all residences and other sensitive environments to the project— such locations will be referred to as relevant places in this assessment report. Section 4.6.2 of the EIS outlined the potential air quality impacts and proposed mitigation measures. Appendix 15 of the EIS included further supporting air quality information, including background monitoring and dispersion modelling of the potential air quality impacts of the project. Appendix 15a of the EIS included additional air quality information in response to the public submissions on the EIS.

5.6.1 Existing environmental values

There are 14 potentially affected relevant places within and surrounding the project site. Figure 5-5 provides the location of relevant places within and surrounding the project. No kindergartens, schools, hospitals, aged care facilities, office buildings, factories or workshops are known to exist near the project.

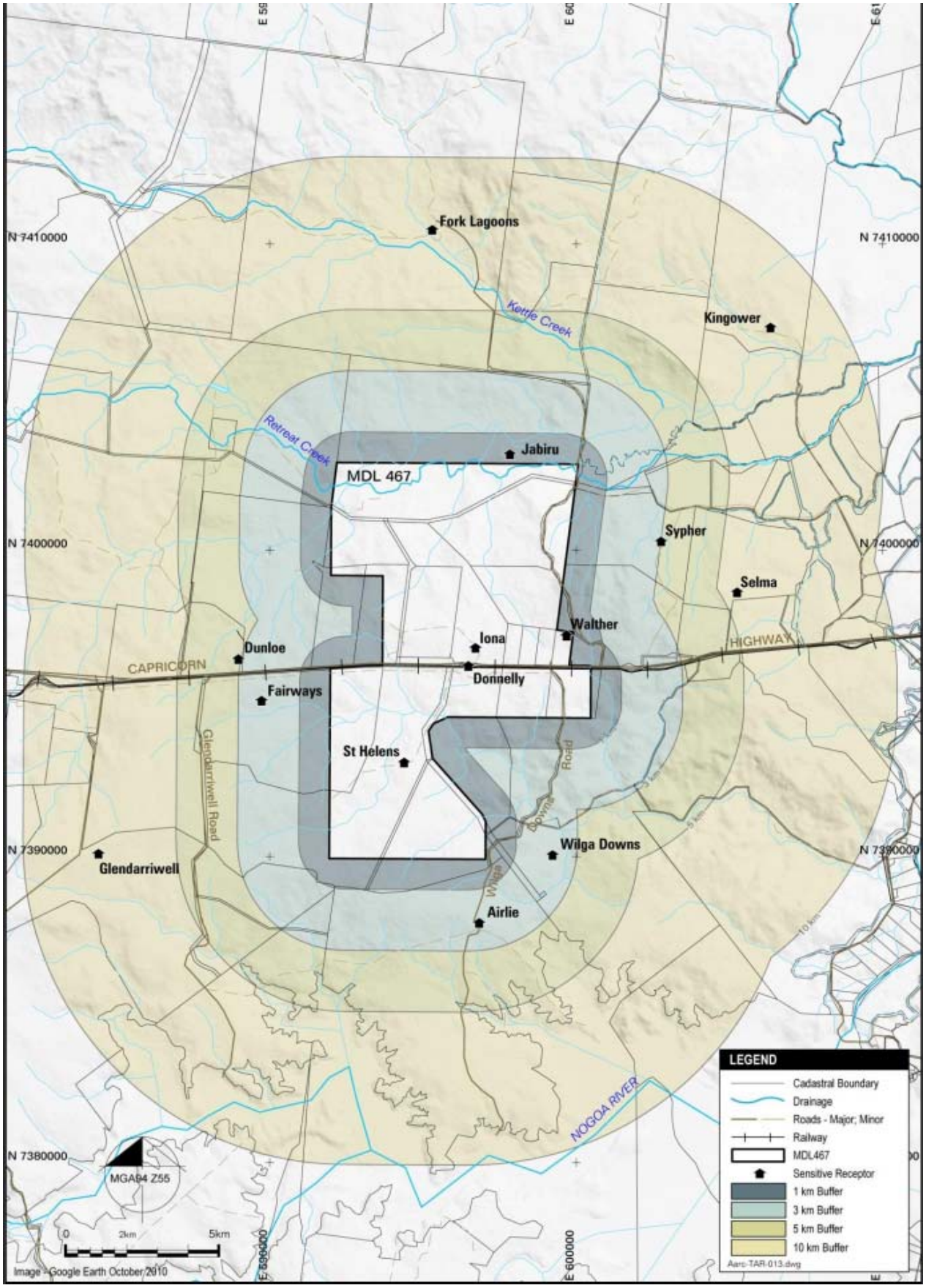
A dust deposition air quality monitoring program was conducted at six homesteads located within and surrounding the project area. The St. Helens, Iona Downs and Walther homesteads are located within MDL467. The Jabiru, Airlie and Dunloe homesteads are located outside of MDL467, but are indicative of dust deposition levels in the region. The lowest average dust deposition rate measured during the five month monitoring period was 24.3mg/m^2/day at the Dunloe homestead, located about 6km west of the proposed open-cut pit. The highest average dust deposition rate measured during the monitoring period was 40.7mg/m^2/day at the Airlie homestead, located approximately 7km south of the proposed open-cut pit. The background dust deposition value used in the air quality model was 40.7mg/m^2/day. The background concentrations of total suspended particulates (TSP), PM_{10} and $PM_{2.5}$ used in the air quality model were derived from monitoring data obtained from other coal mines in the region. Table 5-10 outlines the background values of the air quality indicators used in the model.

Table 5-10 Background air quality parameters used in the model

Air pollutant	Averaging period	Concentration
Total suspended particulates	Annual	28
PM_{10}	24-hour	21
$PM_{2.5}$	24-hour	5.4
	Annual	2.8
Dust deposition	Annual	40.7

Source: Table 19 of Appendix 15 of the EIS

Figure 5-5 Relevant places within and surrounding the project area



Source: Figure 4.99 of the EIS

Note: A 'sensitive receptor' in the above figure equates to a relevant place in the discussion.

5.6.2 Potential impacts and proposed mitigation measures

Years 2 and 5 of project operations were used in the modelling as these years are representative of the open-cut operation and are likely to generate the most dust at the closest relevant places. The later years of operation involve predominantly underground mining with only coal handling and preparation contributing to surface based dust generation.

Tables 5-11 and 5-12 show the predicted levels of each air pollutant at relevant places during Years 2 and 5 of project operations respectively.

Table 5-11 Predicted ground-level concentrations and deposition rates at relevant places during Year 2 of project operations

Receptor	Annual average				Monthly average		24-hour average			
	TSP (µg/m^3)		$PM_{2.5}$ (µg/m^3)		Dust (mg/m^2/day)		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m3)	
	Project site[1]	Cumulative[2]	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative
St. Helens	52.2	80.2	4.3	7.1	92.7	133.4	228.4	249.4	30.7	36.1
Jabiru	1.6	29.6	0.2	3.0	2.5	43.2	24.6	45.6	4.1	9.5
Iona Downs	41.3	69.3	3.1	5.9	111.3	152.0	294.3	315.3	37.7	43.1
Walther	6.2	34.2	0.7	3.5	17.1	57.8	112.2	133.2	15.9	21.3
Airlie	3.9	31.9	0.6	3.4	6.6	47.3	67.1	88.1	11.4	16.8
Glendarriwell	2.6	30.6	0.5	3.3	4.1	44.8	25.5	46.5	6.3	11.7
Dunloe	12.4	40.4	2.0	4.8	17.6	58.3	114.0	135.0	21.9	27.3
Selma	0.7	28.7	0.1	2.9	1.8	42.5	48.3	69.3	8.9	14.3
Kingower	0.5	28.5	0.1	2.9	0.8	41.5	14.8	35.8	2.3	7.7
Fork Lagoons	0.5	28.5	0.1	2.9	0.5	41.2	18.5	39.5	3.7	9.1
Donnelly	85.9	113.9	5.3	8.1	258.5	299.2	330.6	351.6	49.1	54.5
Wilga Downs	1.3	29.3	0.1	2.9	6.0	46.7	32.2	53.2	5.9	11.3
Fairways	17.1	45.1	2.3	5.1	21.8	62.5	138.5	159.5	24.8	30.2
Sypher	1.1	29.1	0.2	3.0	2.1	42.8	28.5	49.5	4.5	9.9
Air quality objective	**90**		**8**		**120**		**50**		**25**	

Source: Tables 21 and 22 of Appendix 15 of the EIS

Table notes: 1. Modelled contributions of the project at each relevant place
2. Modelled contribution of the project, plus estimated background concentrations at each relevant place

Table 5-12 Predicted ground-level concentrations and deposition rates at relevant places during Year 5 of project operations

Receptor	Annual average				Monthly average		24-hour average (maximum)			
	TSP (µg/m^3)		$PM_{2.5}$ (µg/m^3)		Dust (mg/m^2/day)		PM_{10} (µg/m^3)		$PM_{2.5}$ (µg/m3)	
	Project site[1]	Cumulative[2]	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative	Project site	Cumulative
St. Helens	39.0	67.0	3.8	6.6	60.9	101.6	224.2	245.2	31.5	36.9
Jabiru	1.8	29.8	0.3	3.1	2.3	43.0	41.9	62.9	6.9	12.3
Iona Downs	71.1	99.1	5.4	8.2	199.6	240.3	689.0	710.0	86.9	92.3
Walther	7.5	35.5	0.9	3.7	18.7	59.4	138.9	159.9	19.5	24.9
Airlie	3.7	31.7	0.6	3.4	4.8	45.5	56.7	77.7	12.1	17.5
Glendarriwell	2.5	30.5	0.5	3.3	3.9	44.6	27.2	48.2	6.7	12.1
Dunloe	11.8	39.8	1.9	4.7	15.6	56.3	111.6	132.6	21.6	27.0
Selma	0.8	28.8	0.1	2.9	1.8	42.5	52.2	73.2	9.9	15.3
Kingower	0.6	28.6	0.1	2.9	0.8	41.5	18.9	39.9	2.9	8.3
Fork Lagoons	0.6	28.6	0.1	2.9	0.6	41.3	16.7	37.7	3.4	8.8
Donnelly	249.0	277.0	14.4	17.2	776.0	816.7	909.9	930.9	117.1	122.5
Wilga Downs	1.7	29.7	0.2	3.0	6.7	47.4	45.7	66.7	6.9	12.3
Fairways	16.2	44.2	2.3	5.1	22.2	62.9	149.9	170.9	27.1	32.5
Sypher	1.3	29.3	0.2	3.0	2.3	43.0	33.8	54.8	5.3	10.7
Air quality objective	**90**		**8**		**120**		**50**		**25**	

Source: Tables 23 and 24 of Appendix 15 of the EIS

Table notes:
1. Modelled contributions of the project at each relevant place
2. Modelled contribution of the project, plus estimated background concentrations at each relevant place

The annual average ground-level concentrations of TSP, including background levels at all relevant places outside of MDL467 for both modelled scenarios are predicted to be below the air quality objective of 90µg/m³. The TSP air quality objective was predicted to be exceeded at one of the four residences located within MDL467 during Year 2 of project operations, and at two of the four residences located within MDL467 during Year 5 of project operations.

The annual average $PM_{2.5}$ concentrations, including background levels at all relevant places outside of MDL467 for both modelled scenarios are predicted to be below the air quality objective of 8µg/m^3. The $PM_{2.5}$ air quality objective was predicted to be marginally exceeded at one of the four residences located within MDL467 during Year 2 of operations, and at two of the four residences during Year 5 of project operations.

The maximum monthly average dust deposition concentrations, including background levels at all relevant places outside of MDL467 for both modelled scenarios are predicted to be below the air quality objective of 120mg/m^2/day. The dust deposition air quality objective was predicted to be exceeded at three of the four residences located within MDL467 during Year 2 of operations, and at two of the four residences during Year 5 of operations.

The maximum 24-hour average PM_{10} concentrations, including background levels are predicted to exceed the air quality objective of 50µg/m^3 at all four relevant places within MDL467 for both modelled scenarios, and at five of the eleven relevant places outside of MDL467 during Year 2 of operations, and at seven of the eleven relevant places

outside of MDL467 during Year 5 of operations.

The maximum 24-hour average $PM_{2.5}$ concentrations, including background levels are predicted to exceed the air quality objective of 25µg/m^3 at three of the four relevant places within MDL467 and two of the eleven relevant places outside of MDL467 for both modelled scenarios.

Proposed mitigation measures

The proponent proposes a proactive and reactive air quality management strategy during construction and operations to reduce emissions below the air quality objectives at all relevant places.

A dust management plan would be developed in conjunction with a construction management plan that would include the following measures:

- constructing bunds and wind breaks around stockpiles or earthmoving areas
- avoiding earthmoving activities during unfavourable meteorological conditions, where possible
- setting on-site speed limits to minimise wheel generated dust
- watering down bunds, stockpiles and unsealed roads to minimise dust
- limiting vegetation and soil clearing to approved areas, to minimise exposed surfaces
- compact construction sites to minimise dust
- continuous PM_{10} monitoring
- altering site activities when monitoring results show an increase in dust levels
- limiting, reducing, redirecting or stopping significant dust generating activities at times of elevated risk.

An air quality management plan would be developed to minimise emissions during the operational phase of the project and would include the following measures:

- watering and grading haul roads and using road surface treatments
- using water sprays, covers and chutes during coal handling and preparation operations
- progressively revegetating disturbed areas as mining operations develop
- constructing wind breaks (such as tree plantings) around stockpiles
- carrying out continuous, real-time monitoring of meteorological conditions and dust concentrations at all sensitive receptors
- continuously improving train load profiles and loading techniques to avoid coal spillage
- shaping the profile of coal in rail wagons and applying a surface treatment to minimise coal dust emissions during transit to the WICET
- implementing adaptive management strategies (such as reducing extraction rates) when meteorological condition monitoring indicates adverse wind conditions, or dust monitoring at sensitive receptors indicates that dust levels are approaching the air quality objectives
- implementing reactive management strategies, including additional mitigation measures (such as further reducing activity rates, covering equipment or temporarily ceasing operations) when meteorological conditions become particularly adverse
- implementing a complaints management procedure
- consulting with potentially impacted landowners and negotiating site-specific mitigation measures such as installing first flush systems on rainwater tanks.

5.6.3 Major issues raised in submissions

EHP identified that Year 6 of project operations (rather than Year 5) may represent the worst-case scenario for dust emissions because Year 6 was anticipated to result in the greatest volume of overburden stripped during the life of the project. Consequently, EHP requested the proponent to model the predicted dust emissions at relevant places during Year 6. In response, the proponent provided estimates of the emissions rates of dust for Year 6 of project operations and compared them to the emissions rates estimated for Year 5. Based on the predicted change (increase) in emissions rates for Year 6, the proponent inferred that:

- concentrations of TSP, PM_{10}, $PM_{2.5}$ and dust deposition are likely to increase by up to 9% at relevant places
- the annual average concentrations of TSP would remain below the air quality objective at all relevant places
- the 24-hour average concentrations of PM_{10} would not exceed the air quality objective at any additional relevant places
- the maximum 24-hour average concentrations of $PM_{2.5}$ would marginally exceed the air quality objective at one additional relevant places
- the annual average concentrations of $PM_{2.5}$ would not exceed the air quality objective at any additional relevant places

- the maximum monthly average dust deposition rates would not exceed the air quality objectives at any additional relevant places.

EHP considered the additional information provided by the proponent and decided that site-specific air conditions, in addition to the model mining conditions for air quality, could be developed for the draft EA to manage the predicted additional impacts (refer to the air conditions contained in Appendix 1 of this report).

CHRC voiced concerns raised by the Emerald community about the potential for increased coal dust levels from trains hauling product coal from the project through Emerald. CHRC requested the proponent to establish baseline and ongoing dust monitoring in Emerald to identify any impacts. In response, the proponent confirmed its commitment to using low profiling of coal loads and veneering the coal surface in the rail cars to suppress dust from loaded rail cars. The proponent also committed to establishing a dust monitoring program in Emerald, prior to and during, project operations.

DOTE and EHP noted that dust deposition rates greater than the air quality objective of 120mg/m^2/day were predicted in the Brigalow woodland and Brigalow/Belah low open woodland, located close to the proposed open-cut pit and in areas of the adjacent Fairbairn State Forest. Consequently, the departments requested the proponent to assess the potential impacts on the ecological health of vegetation in these areas. In response, the proponent presented, amongst other things, a literature review about the factors influencing the effects of dust on vegetation and concluded that dust loads only exceeding 5g/m^2/day would likely have an adverse effect on plant growth, which is far greater than the highest modelled dust deposition rates.

EHP requested further information from the proponent about the selection and application of various parameters used in the air quality model. In response, the proponent provided further information about the modelling methodology and configuration. EHP reviewed the information provided by the proponent and determined that the modelling methodology was adequate for the project site.

5.6.4 Conclusions and recommendations

The EIS included an adequate assessment of the impacts on air quality as a result of the project. The predicted exceedences of the air quality objectives at relevant places beyond the boundary of MDL467 should be able to be managed by the mitigation and management measures proposed by the proponent. However, the predicted exceedences of the air quality objectives at relevant places within, or near, the boundary of MDL467 are unlikely to be adequately mitigated due to the close proximity of the mining activities to those locations. Consequently, the proponent should continue to liaise with the property owners within, or near, the boundary of MDL467 to either purchase the properties in question, or implement site-specific mitigation measures to the satisfaction of the property owners. Furthermore, EHP has prepared suitable site-specific air conditions that have been included in the recommended draft EA conditions in Appendix 1 of this report. The conditions have a strong emphasis on establishing a proactive and reactive air quality monitoring program that can respond to potential air quality issues.

Recommendation

It is recommended that the proponent continue to liaise with landowners potentially affected by exceedences of the air quality objectives with the intention of reaching outcomes agreeable with the property owners (e.g. purchasing properties or entering into lease agreements).

5.7 Noise and vibration

Section 4.7 of the EIS discussed the noise and vibration aspects of the project. Section 4.7.1 of the EIS included a description of the environmental values, including the existing acoustic environment in the area and the proximity of all residences and other sensitive environments to the project. Section 4.7.2 of the EIS outlined the potential noise and vibration impacts and proposed mitigation measures. Appendix 17 of the EIS included further supporting noise and vibration information, including background monitoring and modelling of the predicted noise and vibration impacts of the project.

5.7.1 Existing environmental values

Figure 3-5 in section 5-6 of the air section above, identifies 14 potentially affected sensitive receptors within and surrounding the project site. No kindergartens, schools, hospitals, aged care facilities, office buildings, factories or workshops are known to exist near the project.

Both attended and unattended noise monitoring to characterise the existing noise environment surrounding the project was conducted between 19 and 27 April 2012 at the Iona Downs, St. Helens, Walther and Jabiru properties. Table 5-13 provides a summary of the unattended background noise levels measured at the four properties.

Table 5-13 Measured background noise levels

Location	Background Noise Level, minL_{90}, dB(A)[1]		
	Day	Evening	Night
Iona Downs	31	36	20
St. Helens	31	24	18
Walther	33	43	27
Jabiru	25	35	19

Source: Table 4.100 of the EIS

Table notes: 1. Lowest tenth percentile corresponding to the median day

The results indicate that background noise levels are lowest during the day at the Jabiru property, lowest during the evening and night at the St. Helens property and highest during the day, evening and night at the Walther property.

The attended noise monitoring indicated that the main contributors to background noise levels were:

- trains
- traffic from the Capricorn highway
- cows, dogs, horses and insects
- mechanical plant
- banging and grinding from homestead shed.

5.7.2 Potential impacts and proposed mitigation measures

The following potential noise and vibration sources from the project were identified:

- light and heavy vehicles accessing the project
- blasting activities during open-cut mining
- underground vent fan and motors
- open-cut mining activities (excavation, hauling, drilling, etc.)
- crushing coal
- conveying and stacking coal
- loading of coal trains.

The following potential low frequency noise sources (i.e. less than 200 Hertz) from the project were identified:

- pumps
- transformers
- cooling fans
- compressors
- oil and gas burners
- electrical installations
- diesel engines
- air-conditioning equipment.

Year 3 of project operations was modelled to predict noise and vibration emissions from the project. Year three was considered to be the worst-case scenario for noise and vibration as the operations include out-of-pit dumping, the majority of mobile equipment would be in use, and mining operations would generally occur across the full extent of the open-cut pits. The CHPP was included in the day and evening noise level predictions, but wasn't included in the night-time noise level predictions, because the plant wouldn't operate at night. The noise and vibration levels from the project were modelled without noise mitigation measures.

Table 5-14 provides a summary of the predicted noise levels at sensitive receptors and a comparison with the noise quality objectives for Year 3 of project operations (representing worst-case conditions).

Table 5-14 Predicted noise levels at sensitive receptors during Year 3 of operations

Location	Predicted Noise Level $L_{eq,1hr}$, dB(A)		
	Day and Evening (dB(A))	Night-time	
	Neutral	Neutral	Adverse
Airlie	22	22	28
Donnelly	47	47	53
Dunloe	24	23	30
Fairways	27	26	33
Fork Lagoons	15	15	18
Glendarriwell	16	15	19
Iona Downs	44	44	51
Jabiru	22	22	28
Kingower	14	14	17
Selma	20	20	24
St. Helens	37	37	44
Sypher	21	21	27
Walther	31	31	39
Wilga Downs	25	25	31
Noise quality objective	**40**	**35**	

Source: Table 4.104 of the EIS

Based on the modelling results, noise levels at two sensitive receptors located within the boundary of MDL467 are predicted to exceed the day and evening noise quality objective of 40dB(A). Noise levels under neutral conditions at three sensitive receptors, and under adverse conditions at four sensitive receptors, located within the boundary of MDL467 are predicted to exceed the night-time noise quality objective of 35dB(A).

The sound power level during the construction phase of the project was estimated to be less than the sound power level during operations. Consequently, the noise emissions during construction are predicted to be less than the noise emissions during operations and would result in fewer (if any) exceedences of the noise quality objectives.

Low frequency noise

Based on the modelling results, the low frequency noise levels at all sensitive receptors are predicted to be below the external low frequency noise quality objective of 55dB, and/or have a spectral difference between the unweighted and A-weighted low frequency noise levels of less than 15dB.

Airblast overpressure and vibration

Based on the modelling results, the airblast overpressure levels at two sensitive receptors located within 1km of the open-cut pit are predicted to exceed the airblast overpressure noise quality objective of 115dB for four out of five blasts.

Based on the modelling results, the ground vibration levels at one sensitive receptor located within 600m of the open-cut pit is predicted to exceed the ground vibration noise quality objective of 5mm/second peak particle velocity for nine out of ten blasts.

Sleep disturbance

Based on the WHO Guidelines for Community Noise (2009) a maximum outdoor sleep disturbance noise quality objective of 47dB(A) was selected for the project. The predicted compliance of the project with the sleep disturbance criterion was not modelled. However, based on an average external noise quality objective of 35dB(A) and a predicted difference between the average and maximum noise events of up to 8dB(A), the sleep disturbance objective of 47dB(A) should be met at all sensitive receptors located beyond the boundary of MDL467.

Rail noise

Up to three trains (six train movements) per day would be required to transport coal from the project to the WICET for export. Trains from the project would travel 24.4km along the Central West rail system to Emerald, and then an additional 372km along the Blackwater rail system to the WICET.

It is predicted that the QR noise quality objective of 87dB(A) would be met at a distance of 40m or more from passing trains under normal meteorological conditions, and at 60m or more under adverse meteorological conditions.

Proposed mitigation measures

The proponent proposes the following measures to mitigate the predicted worst-case noise impacts at sensitive receptors:

- purchasing properties of, or entering into lease agreements with, the landowners of the four properties predicted to be worst affected
- attenuating fixed and mobile plant
- constructing noise barriers at noise sources (i.e. around crushers, pumps etc.)
- implementing alternative (quieter) operating methods (e.g. re-routing haul roads, re-allocating mobile plant, restricting dumping (particularly at night), significant bunding in close proximity to haul routes etc.)
- limiting the power applied to diesel locomotives as they pull away from the mine site
- restricting operations during adverse meteorological conditions
- blast parameter design controls
- no blasting between 6pm and 7am
- responding to noise complaints in consultation with affected residents
- implementing a noise and vibration monitoring program.

5.7.3 Major issues raised in submissions

Two members of the public raised concerns about the noise likely to be generated by mining activities and the potential for sleep disturbance at nearby sensitive receptors. One of the submissions proposed some specific noise reduction measures to be implemented. In response, the proponent included some of the proposed measures into the EIS as additional mitigation measures to be implemented for the project (e.g. noise barriers at noise sources and limiting power to diesel locos as they pull away from the mine). However, some of the proposed measures (electrifying the railway line and daylight train loading only) were excluded by the proponent due to financial and operational constraints. EHP is satisfied that the proponent has added the feasible measures proposed in the submission into the proposed noise mitigation measures for the project.

One member of the public raised concerns about the potential for noise and vibration from blasting to frighten cattle and requested notification prior to blasting from the project. In response, the proponent noted that the blasting impacts were predicted to be very low at the property in question. However, the proponent agreed to include the property owner and any other potentially affected landholders on a blasting notification protocol for the project. EHP is satisfied with the proponent's response to this issue.

5.7.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR for the noise and vibration aspects of the project. The EIS adequately described the existing noise environment potentially affected by the project and the potential impacts of the project on the receiving environment. The predicted exceedences of the noise quality objectives at sensitive receptors well beyond the boundary of MDL467 should be able to be managed by the implementation of mitigation and management measures proposed by the proponent. However, the predicted exceedences of the noise quality objectives at sensitive receptors within, or near, the boundary of MDL467 are unlikely to be adequately mitigated due to the close proximity of the mining activities to those locations. Consequently, the proponent should continue to liaise with the property owners within, or near, the boundary of MDL467 to either purchase the properties in question, or implement site-specific mitigation measures to the satisfaction of the property owners. Furthermore, EHP has prepared site specific noise conditions that have been included in the recommended draft EA conditions in Appendix 1 of this report. These conditions have a strong emphasis on

establishing a proactive and reactive noise monitoring program that can respond to potential noise issues.

QR has recommended (see section 5.3.6 of this report) that the proponent manage the rail transport of coal from the project site to the WICET so that train movements through the Emerald township occur during off-peak times (i.e. 9am-2.30pm and 6pm-6am) to minimise traffic congestion during peak road use periods. Sleep disturbance from train movements during night-time may become an issue for nearby sensitive receptors and the proponent should liaise with the CHRC to determine how this issue should be managed.

Recommendation 1

It is recommended that the proponent continue to liaise with landowners potentially affected by exceedences of the noise quality objectives with the intention of reaching outcomes agreeable with the property owners (e.g. purchasing properties or entering into lease agreements).

Recommendation 2

It is recommended that the proponent liaise with the CHRC to determine how best to manage potential sleep disturbance in Emerald during off-peak, night-time train movements.

5.8 Ecology

Section 4.8 of the EIS discussed ecology. Sections 4.8.1 and 4.8.2 of the EIS provided a description of the ecological environmental values of the site. Section 4.8.3 of the EIS discussed the potential impacts on the ecological environmental values and proposed mitigation measures. Further supporting information was provided in Appendix 18, Terrestrial flora and fauna assessment, Appendix 19, Waterway and aquatic ecology assessment, Appendix 20, Stygofauna survey report, and Appendix, 21 Environmental offsets strategy. The EIS addressed MNES under the EPBC Act in Section 5, Matters of national environmental significance, while Appendix 2 of this report includes an assessment of MNES.

Terrestrial flora and fauna surveys were carried out in the dry season from the 8 to 16 September 2011 and in the wet season from 28 February to 5 March 2012. Aquatic flora and fauna surveys were carried out in October 2011 and February 2012. A stygofauna assessment was carried out in September 2011, and a targeted bat survey on 7 and 8 August 2012.

5.8.1 Existing environmental values

The Taroborah Coal Project is located in the Nogoa River catchment. Retreat Creek and Taroborah Creek, which are tributaries of the Nogoa River, both flow through the site. The project area is in the Basalt Downs subregion of the Northern Brigalow Belt bioregion, but has been extensively clear and is mostly used for agriculture. The proposed mining lease area covers 5186.2ha, of which 30.2% is remnant vegetation.

5.8.1.1 Vegetation communities

Table 5-15 lists twelve distinct vegetation communities identified within the project area during field surveys. Ten of those communities meet the descriptions of regional ecosystems (REs), while two do not. Of the ten REs, four have endangered biodiversity status, five have of concern biodiversity status, and the remaining one has no concern at present biodiversity status.

Table 5-15 Regional ecosystems in the Taroborah project area

RE[1]	Description	VMA[2] class	Biodiversity status	Ground-truthed RE area (ha)	Subsidence disturbance area (ha)	Total area to be cleared (ha)
11.3.3a	Riverine wetland or fringing riverine wetland and *Melaleuca bracteata* woodland on alluvial plains	Of concern	Of concern	143.0	0	0
11.3.6	*Eucalyptus melanophloia* woodland on alluvial plains	Least concern	Of concern	33.2	33.2	0
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	Least concern	Of concern	190.1	0	0

RE[1]	Description	VMA[2] class	Biodiversity status	Ground-truthed RE area (ha)	Subsidence disturbance area (ha)	Total area to be cleared (ha)
11.3.27	Palustrine wetlands dominated by persistent emergent vegetation	Least concern	Of concern	112.5	0	0
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* on Cainozoic clay plains	Endangered	Endangered	31.2	0	0
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	Endangered	4.1	4.1	0
11.5.3	*Eucalyptus populnea* and/or *E. melanophloia* and/or *Corymbia clarksoniana* on Cainozoic sand plains	Least concern	No concern at present	191.2	31.9	0
11.9.1	*Acacia harpophylla*/*Eucalyptus cambageana* open forest to woodland on fine-grained sedimentary rocks	Endangered	Endangered	72.6	2.76	2.76
11.9.10	*Acacia harpophylla*, *Eucalyptus populnea* open forest on fine-grained sedimentary rocks	Of concern	Endangered	130.9	67	0
11.10.3	*Acacia catenulata* or *A. shirleyi* open forest on coarse-grained sedimentary rocks, crests and scarps	Least concern	No concern	95.2	11.2	0
	Lacustrine (artificial freshwater dam) wetlands	N/A	N/A	32.2	27.4	0
	Non-remnant grasslands	N/A	N/A	5,632.5	1,701.6	320.8

Source: Table 4.113 of the EIS

Table notes: 1. RE = Regional ecosystem 2. VMA = *Vegetation Management Act 1999*

During the field surveys some vegetation communities on the project site were noted for their potential to have some reliance on groundwater. A close association was noted between palustrine wetlands and REs along Retreat Creek in the north of the project site. These REs consists of 190.1ha of river red gum riparian woodland (RE11.3.25 *Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines) and 26.2ha of river teatree riparian woodland (RE 11.3.3a riverine wetland or fringing riverine wetland and *Melaleuca bracteata* woodland on alluvial plains). About 117ha of RE11.3.3a in the riparian area of Taroborah Creek was also mapped during the field survey.

Measured groundwater levels in the vicinity of Retreat and Taroborah Creeks range between 6m–10m below ground level. That depth is shallow enough for deep-rooted vegetation species, such as eucalypt species of RE11.3.25 and RE11.3.3a, to have the potential to access and use the sub-surface groundwater.

5.8.1.2 Terrestrial flora species

A total of 205 flora species including 33 introduced species were identified within or immediately adjacent to the project area. No species of conservation significance as listed under the *Nature Conservation Act 1992* (NC Act) or under the *Environmental Protection and Biodiversity Conservation Act 1999* were recorded.

5.8.1.3 Terrestrial fauna species

A total of 124 vertebrate fauna species were recorded within the project survey area, comprising seven amphibians (one introduced), eight reptiles, 81 birds and 28 mammals (six introduced).

The little pied bat (*Chalinolobus picatus*), which is listed as near threatened under the NC Act, was the only species of conservation significance located in the project area surveys.

The EIS also identified fauna species listed under the NC Act that could possibly occur in the project area based on habitat availability. The species considered to possibly occur included:

- squatter pigeon (southern) (*Geophaps scripta scripta*) – vulnerable
- black-chinned honeyeater (*Melithreptus gularis*) – near threatened
- cotton pygmy-goose (*Nettapus coromandelianus*) – near threatened
- red-tailed tropicbird (*Phaethon rubricauda*) – vulnerable
- Australian painted snipe (*Rostratula australis*) – vulnerable
- radjah shelduck (*Tadorna radjah*) – near threatened
- common death adder (*Acanthophis antarcticus*) – near threatened
- ornamental snake (*Denisonia maculate*) – vulnerable
- yakka skink (*Egernia rugosa*) – vulnerable
- grey snake (*Hemiaspis damelii*) – endangered
- brigalow scaly-foot (*Paradelma orientalis*) – vulnerable
- Fitzroy river turtle (*Rheodytes leukops*) – vulnerable
- golden-tailed gecko (*Strophurus taenicauda*) – near threatened.

Aquatic species

The ecological assessment identified the following aquatic values in the survey area:

- Centre Creek originates to the west of MDL467 and flows into Retreat Creek in the north-west corner of the project site
- Retreat Creek is a fourth order watercourse that flows in a west to east direction in the north of the project area and flows into Theresa Creek, before joining the Nogoa River
- Taroborah Creek is a second order watercourse that flows in a west to south-east direction in the south of the project area and flows into St. Helens Creek, before joining the Nogoa River
- all other surface water drainages are ephemeral stream order 1 and 2 drainage lines
- several palustrine and lacustrine wetlands occur in the project area (scoring as medium under the Queensland Aquatic Conservation Assessment)
- no threatened plants under either the NC Act or EPBC Act were located at aquatic survey sites
- surveys identified 47 macro-invertebrate taxa; 43% of all specimens collected in the dry season were from four families: true fly (*Diptera*: *Tanypodinae*), backswimmers (*Hemiptera*: *Notonectidae*), water boatmen (*Hemiptera*: *Corixidae*) and diving beetles (*Coleoptera*: *Dytiscidae*)
- surveys identified six fish species with the most common being spangled perch (*Leiopotherapon unicolour*), southern purple-spotted gudgeon (*Mogurnda adspersa*) and Agassiz's glassfish (*Ambassis agassizi*).
- Surveys identified five amphibian and six reptile species in association with the riparian communities in the project area
- no subterranean fauna were detected from 7 sample locations.

5.8.2 Potential impacts and significance of impacts

The following potential impacts on conservation values may occur as result of project activities:

- complete loss of 473ha of vegetation cover (of which 152.2ha is remnant vegetation) would occur in the area associated with open-cut mining and surface infrastructure
- construction of the eastern open-cut mine haul road through brigalow woodland (RE 11.9.1) would result in the loss of 2.76ha of the 72.6ha of brigalow identified on-site
- injury or death of fauna could occur during the life of the project, with the greatest potential during the construction phase
- edge effects from proposed works could alter microclimatic conditions due to greater light intensity, increased wind penetration and lower humidity due to vegetation removal
- dust cover generated by vehicle movement on unsealed roads could reduce plant health through the reduction of photosynthesis
- additional noise from mine site operations could disturb fauna. Noise would be concentrated around the open-cut pit, coal processing plant, haul roads and decline areas
- artificial lighting commonly attracts insects, which would in turn result in a higher abundance of amphibians, microbats and reptiles that would take advantage of increased numbers of prey
- reduction of habitat provided by leaf litter, trees with hollows, and fallen timber, plus resultant changes to soil biota, may result in a loss of biological diversity
- land clearing activities may increase soil erosion, causing silting or sedimentation of riverine habitats and

waterholes downstream, and disruption of natural nutrient cycling
- increased concentrations of nutrients such as nitrogen and phosphorous from by-products of human and industrial waste could increase the abundance of algae and aquatic plants that could lead to eutrophication of wetlands
- an increase of pest fauna species could result from increased availability of food sources such as improperly disposed food scraps by staff during project operations
- processing and mining activities could contaminate riverine habitats and waterholes downstream
- introduction of additional weeds and spread of weeds within the project area via seed transport on vehicles and machinery
- the predicted groundwater drawdown in the alluvium of Retreat and Taroborah Creeks, both on and off the project site, has the potential to reduce the availability of groundwater for the deep-rooted eucalypt species of RE11.3.25 and RE11.3.3a on-site, and other potential GDEs off-site
- 33.1ha of ephemeral aquatic habitat with associated tributaries could be impacted by subsidence due to underground mining
- wetlands, especially the lacustrine wetland in the centre of the subsidence area, are likely to experience tension cracking along the banks and potentially alter the depth and extent of water
- the seven vegetation communities within the subsidence area may experience the following impacts:
    - changes to the drainage profile and additional ponded areas
    - if water in ponded areas has sufficient depth (typically 1m or more), this could significantly impact on remnant vegetation causing dieback
    - surface cracking due to subsidence is predicted to be up to 5m deep with a maximum width of 0.3m; and while cracking itself would not necessarily impact on vegetation, the rehabilitation of cracks would involve remedial earthworks that could impact on vegetation due to land disturbance and vehicle movements.

5.8.3 Proposed mitigation measures

The EIS proposed several measures to avoid and mitigate potential impacts on ecological values. The main mitigation measures may be summarised as follows:

- vegetation clearing within the project area would be minimised to only those areas required for project operations
- native vegetation removal would only occur after:
    - clearance areas are clearly delineated and made clear to equipment operators and supervisors
    - weed control measures, such as vehicle wash-down, are implemented to prevent weed species spreading along riparian corridors
    - appropriate erosion and sediment-control structures are in place
    - clearing permission is attained from the site's environmental staff
- suitable sediment and erosion control measures would be implemented to prevent sediment deposition in adjacent retained habitats. All retained areas of remnant vegetation would be protected and maintained for the life of the project to ensure seed availability for mine rehabilitation works
- flora species used for rehabilitation would be appropriate to the landscape of the project area and consistent with relevant vegetation community descriptions
- landforms would be created and contoured to resemble the original local topography
- planning and construction of project infrastructure would avoid the creation of shallow, ponded areas that could form a permanent seep
- habitat areas due to be impacted would be surveyed prior to clearance to determine fauna presence, and any fauna located would be given the opportunity to move themselves away or be relocated prior to clearing
- staff induction program would incorporate information on the conservation values of the project area and its surrounding areas to increase staff awareness. This information would include photographs, descriptions and the management requirements for known conservation values
- progressive rehabilitation of disturbed areas would occur as soon as practicable, to minimise soil erosion and the length of time land is altered from its pre-mining condition. Rehabilitation will aim to restore native vegetation such that it is capable of supporting low intensity cattle grazing. A rehabilitation strategy specific for riparian habitat requirements would be developed following annual monitoring of riparian areas likely to be impacted by subsidence
- subsidence impacts would be mitigated in accordance with a Subsidence Management Plan, which would include the following mitigation measures:
    - subsidence-induced ponding would be mitigated by remedial earthworks designed to re-establish free drainage
    - monitoring for the locations of tension cracks would be undertaking followed by remedial

earthworks to seal surface cracks. The plan would include measures to ensure that remediation works on tension cracks would minimise impacts on surrounding vegetation, and any disturbance to vegetation communities during repairs to tension cracks would be rehabilitated to return the vegetation to pre-disturbance condition

- in order to minimise impacts on aquatic flora and fauna, the proponent proposes the following measures:
  - all contaminated mine and process water would be contained within a closed loop system and recycled. No contaminated mine or process water would be discharged from the project area
  - sediment traps would be place downstream of all land disturbance (such as spoil dumps) to remove sediment from stormwater flowing off these areas prior to release
  - a water and sediment quality monitoring program would be initiated and be in place for the life of the project. This monitoring program would ensure early detection of impacts and provide for corrective action to be undertaken
  - disturbed areas would be progressively rehabilitated at the earliest opportunity
  - a 50m buffer zone would be implemented around sensitive aquatic ecosystems
- to avoid eutrophication of aquatic water systems, nutrient control strategies include:
  - installation of sewage treatment facilities with sufficient capacity to handle site waste
  - retention of wastewater effluents and diversion of non-mine-affected water as part of the surface water management system for the project
  - minimised use of detergents containing phosphate
  - bioactive glyphosate would be used for weed treatment in areas located close to watercourses
  - monitoring of the quality of receiving waters
- proposed management strategies for the protection of the little pied bat within the project area include:
  - maximised retention of hollow-bearing trees, alive and dead, as potential roosting sites
  - maximised retention of remnant vegetation adjacent to wetlands such as dams and watercourses, in order to maintain habitat to support insect diversity and abundance
  - fauna spotters to thoroughly survey areas prior to vegetation clearing
- control measures for introduced flora species include:
  - undertaking a risk assessment of high biosecurity risk species and their locations
  - restriction of vehicle movement to designated roads except where necessary for mine operations
  - prevention of water and fertiliser run-off into bushland
  - maintenance of buffers or windbreaks around disused revegetated area when applicable
  - machinery and off-road vehicles cleaned (inclusive of visitors)
  - weed management covered in site induction program to inform staff of possible weed species in the project area, known weed infestations and how to report new infestations
- a pest management plan would be developed, in which the presence and success of pest control strategies would be monitored within the project area. Control measures for pest animal control will include:
  - implementation of effective dingo control methods such as shooting and fencing in combination with current land management practises
  - feral cat control including trapping
  - European rabbit control, including warren ripping and shooting
  - feral pig control using physical controls including shooting and/or barrier construction
  - disposal of food scraps in appropriate containers for collection by a suitably qualified contractor.

5.8.3.1 Offsets

The proponent has committed to providing offsets after project approval, but before commencement of project activities. The proponents preferred option to meet regulatory requirements is to provide a land-based offset via an agreement with an offset broker or provider. The proponent has not detailed impacts that are likely to occur to MSES values, such as watercourse vegetation and connectivity. The EIS did not adequately assess potential groundwater drawdown impacts on RE11.3.25 and RE11.3.3a. EHP believes that these regional ecosystems, on and off the project site within the predicted extent of groundwater drawdown (including Retreat Creek to the north and 3.5km east of the MDL467 boundary), must be suitably monitored during project operations to identify any changes in ecosystem health. Where impacts to ecosystem health are identified, additional offsets would need to be provided. Appendix 1 of this report provides recommended draft EA conditions for monitoring ecosystem health and potential offsets.

The proponent has not quantified the impacts of subsidence to either MNES or MSES values and, should any impacts occur to any values within the subsidence area, these would need to be offset accordingly. The proponent is committed to providing the following offsets for significant impacts on MNES:

- 2.76ha of brigalow threatened ecological community (TEC) for which the proponent is prepared to locate an offset of 11.04ha
- 149.43ha of natural grassland TEC for which the proponent is prepared to locate an offset of 587.72ha.

5.8.4 Major issues raised in submissions

In its submission on the EIS, EHP commented that the Queensland Herbarium regional ecosystem mapping indicated there were areas of the natural grasslands TEC mapped within the project area. Furthermore, during a site visit undertaken during the EIS submission period, an EHP officer sighted key natural grassland species. However, the proponent had not undertaken a flora survey at any sites within these mapped areas. EHP recommended that the proponent should conduct flora surveys within the natural grassland mapped areas to confirm the extent of the TEC. In response to this issue, the proponent acknowledged that natural grassland areas existed within the project area and agreed that further field surveys would be prudent in order to identify the extent of the natural grasslands TEC. The proponent committed to conducting the assessment prior to the project development, and to offsetting any found TEC to the extent of the mapped natural grassland TEC that would be impacted by the project. EHP was satisfied that this would be an acceptable mitigation measure.

5.8.5 Conclusions and recommendations

With the exception of the natural grassland TEC and potential groundwater dependent ecosystems (RE11.3.25 and RE11.3.3a on-site, and other potential GDEs off-site), the EIS used adequate studies, survey methods and effort to assess and quantify the potential impacts of the project on the ecological values of the site, and met the requirements of the final TOR. Potential impacts to RE11.3.25 and RE11.3.3a on-site, and other potential GDEs off-site, were not adequately quantified in the EIS. Consequently, the proponent will be required to identify the potentially impacted GDEs on the project site, or off the site where access is available or can be obtained. They will also be required to monitor the ecological health of these communities during project operations, and offset any identified impacts. The proponent has made commitments to manage, monitor and rehabilitate disturbed areas to achieve appropriate ecological outcomes. However, as noted above, the flora surveys within the mapped natural grassland TEC were not adequate. Nevertheless, the proponent's commitment to offset the impacts to this community satisfactorily addressed any potential impacts of the project on this community.

Following Commonwealth approval, the proponent would need to propose a suitable offset strategy that would compensate for significant impacts to MNES under the requirements of the EPBC Act environmental offsets policy. Conditions for biodiversity offsets have been included in Schedule H of the recommended draft EA conditions to limit and manage adverse impacts to biodiversity likely to be caused by project activities. In order for the project impacts from subsidence to be managed, Schedule H of the draft EA conditions require a subsidence management plan (including rehabilitation) to be developed and implemented by the proponent. Under the plan, the proponent is required to monitor the extent of subsidence impacts, such as cracking and ponding on ecological values. This would be particularly relevant where such impacts affect tributaries of Taroborah and Retreat Creeks, aquatic ecosystems, MSES and MNES values and any groundwater dependent ecosystems.

The following recommendations address the key outstanding issues in relation to the ecological values of the site:

Recommendation 1

The proponent should complete flora surveys before any disturbance for construction of the mine at the site to ensure that impacts on MNES are as described in the EIS and/or as summarised in this report. The surveys should cover areas that would be affected by underground mining as well as open-cut mining, including the associated infrastructure. Before any disturbance for construction, the proponent should report the results of pre-clearing surveys to the Department of the Environment, and state the extent of the necessary offsets for residual impacts.

Recommendation 2

The proponent should finalise the biodiversity offset strategy consistent with the EPBC Act environmental offsets policy and offsets assessment guide. This would include field surveys to confirm the presence of the natural grasslands TEC within the project area. The strategy should describe the mechanism for delivering offsets. There would also need to be field surveys to confirm that brigalow TEC and natural grassland TEC are present at proposed offset locations and to confirm that the condition and extent of the proposed offset area(s) is sufficient to offset the residual impact to 2.76ha of brigalow and 149.43ha of natural grassland.

Recommendation 3

The proponent should use the Australian Groundwater Dependent Ecosystem Toolbox evaluation framework to identify the ecological water requirements of potential GDEs located within the predicted zone of groundwater depressurisation. The survey area should include land on the project site (including RE11.3.25 and RE11.3.3a), and off-site within or adjacent to publicly accessible land, and any other land where access can be obtained.

Recommendation 4

The proponent should complete a baseline assessment of the condition (using the Biocondition methodology[2]) and extent (in hectares) of all potentially impacted GDEs identified out of recommendation 3 above.

Recommendation 5

The proponent should assess the likely causes and extent of potential impacts on the identified GDEs, and propose mitigation measures, and offsets for residual impacts. Offset actions that could be undertaken should be included in a revised biodiversity offset strategy (refer to the recommended draft EA conditions in Appendix 1 for further details).

Recommendation 6

The proponent should establish groundwater monitoring bores in the location of all potentially impacted GDEs and monitor groundwater depth and quality according to the groundwater monitoring conditions (refer to the recommended draft EA conditions in Appendix 1 for further details).

Recommendation 7

The proponent should monitor the health of all potentially impacted GDEs during project operations for such changes as vegetation dieback, or a significant change in species diversity that could be associated with groundwater depressurisation or a change in groundwater quality as a result of the project. The monitoring program should include trigger values for monitored parameters that would prompt corrective action to be taken to avoid, minimise or offset impacts.

Recommendation 8

The proponent should liaise with EHP's wildlife management branch to determine whether clearing permits and/or species management plans are required under the Nature Conservation (Wildlife Management) Regulation 2006.

5.9 Cultural heritage

Section 4.9 of the EIS discussed the indigenous and non-indigenous cultural heritage aspects of the project. Section 4.9.1.1 of the EIS provided a description of the non-Indigenous cultural heritage environmental values based on a historic heritage study. Section 4.9.2.2 of the EIS provided a description of the Indigenous cultural heritage values. Appendix 22 of the EIS included a historic heritage management plan.

5.9.1 Non-Indigenous cultural heritage values

No sites or places of non-Indigenous heritage significance on the project site were found on the National, Queensland or local government heritage registers. A non-Indigenous historical heritage study was undertaken to identify any historical cultural and landscape heritage values in the project area. Table 5-15 provides a summary of the sites identified on the project site during the survey.

Table 5-15 Cultural heritage sites identified on-site during the non-Indigenous survey

Site name	Site description
Taroborah siding	Rail siding with lengthsman's residence, (early 20th century) located along the Capricorn Highway
Surveyor's tree	Mature bloodwood with surveyor double marks from the late 19th century
Iona station	Substantial station comprised of two houses and numerous functional buildings and structures, from 1950 to 2000s, including a major dam and a former dip
St. Helens station	Head station with buildings spanning the 1950s to 1980s, as well as yards and water

[2] BioCondition: a condition assessment framework for terrestrial biodiversity in Queensland: assessment manual. T.J. Eyre [et al.] Ver 2.2 (2015) (or later versions)

Site name	Site description
	infrastructure. Former St. Helens run
Telegraph pole/alignment	One of two identified poles along the St. Helens main farm track (access road)
Stock route and loading yards	Stock route alignment from the 19th century, with related loading yards (unknown date)
Taroborah residence	House relocated from Taroborah siding during the early 20th century

Source: Adapted from Table 4.118 of the EIS

All seven of the identified non-Indigenous cultural heritage sites were assessed to be of low State and local significance based on the criteria under the EHP guideline, Using the criteria; a methodology (EPA 2006), and the standard criteria under the *Queensland Heritage Act 1992*. However, Taroborah siding was assessed as having some significance sufficient to warrant further research and recording should its integrity be affected by the project in the future.

5.9.2 Potential impacts and proposed mitigation measures

The potential impacts of the project on the non-Indigenous cultural heritage sites identified on site are summarised in Table 5-16.

Table 5-16 Potential project impacts on non-Indigenous cultural heritage sites

Site name	Potential impacts
Taroborah siding	Direct impact due to ground subsidence, or cumulative indirect impact due to the proximity of the site to other infrastructure
Surveyor's tree	Possible impact from subsidence
Iona station	Possible impact from subsidence
St. Helens station	Not impacted
Telegraph pole/alignment	Not impacted
Stock route and loading yards	Not impacted
Taroborah residence	Possible impact from subsidence

Source: Adapted from Table 4.121 of the EIS

Of the seven cultural heritage sites that have been identified during the assessment, one would be directly impacted by subsidence (Taroborah siding), and three other sites may be impacted by subsidence.

The proponent has developed an historic heritage management plan (HHMP) that includes a record of each site and measures to manage any direct or indirect impacts. With regard to the Taroborah siding, the HHMP recommends that the following management measures be implemented prior to any anticipated ground subsidence, or impacts from constructing the road and rail infrastructure associated with the project:

- brief additional research to attempt to confirm the provenance of the complex and establish details about its history
- a detailed archival report prepared by a qualified cultural heritage professional, including a statement of significance, site sketch map, description, and photographic record
- lodgement of the archival report in local libraries and the John Oxley State library.

Other management measures proposed to be implemented include:

- a cultural heritage induction booklet issued to all relevant staff during site induction
- a stop works procedure if any unexpected cultural heritage material or sites are encountered during the construction and operational phases of the project.

5.9.3 Indigenous cultural heritage values

No Indigenous heritage sites were listed on the Queensland Heritage Register for the area. A search of the DATSIMA register and database identified nine Indigenous heritage sites within MDL467. However, all nine sites are located 4.5km, or further, south of the mining disturbance footprint and would not be impacted by the project.

Two Native Title determinations by the Bidjara #7 People and the Western Kangoulu People are under consideration by the National Native Title Tribunal.

5.9.4 Potential impacts and proposed mitigation measures

A cultural heritage management plan (CHMP) is currently being prepared for the project between the proponent and the Bidjara #7 People and the Western Kangoulu People, who are the registered cultural heritage claimants for the area. The management approach under the CHMP would involve systematic surveying of mine disturbance areas and mitigation of any impacts to cultural heritage significance identified.

5.9.5 Major issues raised in submissions

No major cultural heritage issues were raised in submissions on the EIS for the project.

5.9.6 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to Indigenous and non-Indigenous cultural heritage. Indigenous cultural heritage on the project site would be managed according to the CHMP approved under the *Aboriginal Cultural Heritage Act 2003*. The non-Indigenous cultural heritage sites identified on-site have been recorded and management measures to address any impacts have been included in the HHMP for the project.

There are no specific indigenous or non-Indigenous cultural heritage recommendations for the project

5.10 Social

Section 4.10 of the EIS outlined a social impact assessment (SIA) for the area that was developed in consultation with the social impact assessment unit of DSDIP. Appendix 23 of the EIS included a social impact management plan (SIMP) that outlined a number of plans and strategies to minimise the social impacts of the project.

5.10.1 Social values

The EIS stated that there are 19 properties located either partly or entirely within MDL467 (excluding easements) with 11 registered owners. Properties directly affected by the project would either be purchased by the proponent, or surface rights would be acquired to allow the proponent to use the land for the term of the mining lease, and then the surface rights revert back to the original owner when the lease is relinquished. Such arrangements would be subject to discussions with each affected landholder.

The EIS stated that consultation with various community stakeholders revealed that local residents value their relaxed lifestyle and safe environment. The rich history and active community of Emerald is highly valued by its residents, who also have access to a range of services and community facilities, including:

- **health** – the Central Highlands is serviced by Blackwater, Springsure and Emerald hospitals that include medical and surgical, specialist clinics, clinical support and allied health services. Also, the Emerald region is serviced by 16 general practitioners
- **emergency** – the Emerald police station is supported by 20 uniformed officers and two traffic officers. Ambulance services are provided from Emerald and currently consist of three vehicles and eight officers on 24-hour rosters. Anakie, in the Gemfields area, has a single ambulance and officer. Emerald is located within Queensland Fire and Rescue Service's Central Region
- **education** – Emerald provides important education services for the region, including three state primary schools, a state secondary school, three independent colleges, the Capricorn School of Distance Education, Technical and Further Education , a University and the Emerald Agricultural and Pastoral College. Five child-care services are located in Emerald, some of which offer preschool facilities. Child-care facilities are under pressure in Emerald, with demand for places exceeding supply
- **transport** – Emerald offers aeroplane, train and bus services across the region. Transport issues are discussed in the Transport section of this assessment report
- **recreation, leisure and culture** – Emerald offers well-resourced and well-utilised sport, recreation and leisure facilities in region. Facilities include gymnasium, art gallery, cinemas and a range of sport and recreation clubs.

The EIS described the demographic profile of the study area based on the 2011 ABS Census and more recent research, which found that:

- Emerald's residential population was 13,576, constituting approximately 46% of the Central Highlands local government area (LGA) population of 29,533
- 1,021 persons in Central Highlands were of Indigenous origin, 441 of whom resided in Emerald
- unemployment rates in Emerald and Central Highlands (2.2%) were less than half the Queensland average (5.5%)
- mining was the principal industry of employment in the Emerald and Central Highlands areas (22.6% and 26.0%, respectively), compared to Queensland at 2.6%. This was followed by the construction industry in Emerald and the agriculture, forestry and fishing industry in Central Highlands
- there were 7,698 separate houses in the Central Highlands local government area, 3,176 of which were in Emerald, constituting approximately 68% of all private dwellings. This compares to 70.4% for Queensland
- the highest rate of unoccupied dwellings (20.7%) occurred in the Central Highlands LGA, followed by Emerald (16.4%) and Queensland (10.3%)
- the median house price in Emerald dropped to $425,000 which is a fall of 7.8% in 12 months. Median unit prices fell 16.9% during the same period
- there were 69 accommodation villages in the Bowen Basin in 2012, including 20 small camps (less than 100 beds), 30 medium camps (100 to 499 beds), 14 large camps (500 to 999 beds) and five very large camps (1,000+ beds). The 69 villages had a total sleeping capacity of 27,565 beds.

5.10.2 Potential social impacts

A number of potential social impacts on the affected landholders and the Emerald area (and more broadly, the Central Highlands LGA) were identified during the social impact assessment process. Of these, the major impacts included:

- **landholders/rural lifestyle** – many landholders expressed concerns about project related increases in dust, noise and light levels, resulting in a devaluation of their land. Also, landholders expressed concern that the region could experience a loss of identity as more people move from traditional industries to mining as a result of the higher wages
- **land use** – the predominant land use concern is potential impact on the local area's water supply. Landholders fear that the project would negatively impact the aquifer beneath MDL467, resulting in bore water levels decreasing, thereby placing the local area at risk during drought conditions
- **childcare** – while it is not expected that the project would greatly impact local childcare services, it is understood that this is a key issue for the region as childcare places are limited
- **highways and roads** – the section of the Capricorn Highway between Emerald and Taroborah is of concern, with local residents reporting ongoing road maintenance due to structural problems since the highway base is situated on unstable black soil. Another major concern is the potential for coal trains to travel through Emerald, traversing two major roads at three level crossings. If the level crossings are blocked simultaneously due to the length of the coal trains, road safety issues and the blocking of emergency vehicle could arise. However, the proponent stated that planned length of the coal trains would not be long enough to block both level crossings at the same time.
- **local business and employment** – there is real potential for project related opportunities but the project may also put pressure on non-resource businesses.

The other potential social impact areas include the cumulative effect of nearby Galilee projects coming to fruition, including effects on:

- changing demography, psychological impacts
- community values, recreation and leisure pursuits
- social order; education
- healthcare, emergency services, public and community transport; utilities, tourism
- housing and accommodation
- cultural heritage and the environment.

Mitigation measures to address potential social impacts are incorporated in Tarobarah's social impact management plan (SIMP) that includes:

- establishing a community consultative committee, supported by key community influencers, Queensland government and council to monitor and address cumulative impacts jointly and relatively
- participating in regional planning and contributing to initiatives that attract government funding for improved community infrastructure and services
- maximising local business and employment opportunities through maintaining close relationships with key

business and employment facilitators, such as the industry capability networks, Training Queensland and the Kinetic group
- developing and implementing a number of key strategies and plans, including:
    - land access management plan
    - traffic management plan
    - environmental management plan
    - drive safe program
    - enquires and complaints management process
    - community investment program
    - indigenous participation strategy
    - workforce accommodation strategy
    - employee behavioural code
    - employee induction program.

5.10.3 Major issues raised in submissions

DATSIMA requested the proponent to provide further information about the consultation undertaken with Aboriginal People during the EIS process. In response, the proponent stated that, in addition to regular liaison with Traditional Owner groups, consultation was undertaken with a range of local Indigenous stakeholders, including DATSIMA, the Central Highlands Aboriginal Corporation and local health service providers to understand Indigenous health, education and employment issues across the region. Furthermore, the consultation process with Indigenous stakeholders was used to develop the project's Indigenous participation plan provided in Appendix 23 of the EIS. DATSIMA was satisfied with the proponent's response and did not ask any further questions in relation to this issue.

DATSIMA requested the proponent to develop an Aboriginal and Torres Strait Islander action plan that aligned with existing programs and resources, and that identified:

- opportunities for training and employment supported by funding
- full-time, part time and school based traineeships and apprenticeships
- opportunities for cadetships
- business development and contracting opportunities and support to ensure ongoing development
- potential barriers to success and initiatives necessary to support success.

In response, the proponent amended the social impact management plan to include an outline for an Indigenous participation plan in Appendix 23 of the EIS. DATSIMA was satisfied with the proponent's response and did not raise any further issues.

5.10.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the social aspects of the project. The EIS adequately described the potential impacts of the project on the social environment and proposed impact mitigation and management measures to minimise these impacts, including establishing a community consultative committee to monitor and address cumulative impacts from mining and expansion.

There are no specific social and economic recommendations for the project.

5.11 Health and Safety

Section 4.11 of the EIS described the health and safety aspects of the local community potentially impacted by the project. Section 4.11.1 of the EIS provided a description of the community values for public health and safety that may be affected by the project. Section 4.11.2 of the EIS included a description of the potential impacts on those values and proposed mitigation measures to address the potential impacts.

5.11.1 Description of environmental values

The community values potentially affected by the project include the following:

- downstream water quality
- air quality and noise nuisance impacts at residences close to the mine
- community health
- transport safety.

The potentially affected places nearby to the project are shown in Figure 5-5 of section 5.6, Air, of this report.

5.11.2 Potential impacts and proposed mitigation measures

The following project impacts have been identified as having the potential to affect the health and safety of the local community:

- air quality impacts from dust emissions
- noise and vibration impacts from operating project machinery and blasting
- degradation of downstream water quality from contaminated surface run-off and unplanned discharges from the project
- health risks associated with an increase in disease vectors on-site
- health risks from contaminated land on-site
- transport safety from more traffic and driver fatigue associated with the project
- critical failures of on-site containment infrastructure.

The measures proposed by the proponent to mitigate potential impacts of the project on health and safety include the following:

- air and noise controls on-site to reduce off-site impacts
- purchasing or leasing properties predicted to be adversely affected by noise and dust impacts from the project
- monitoring the off-site air and noise environment and implementing adaptive management practices on-site, as necessary
- construction and operation of regulated dams on-site according to the relevant standards and best practices to minimise the likelihood of overtopping or dam break and prevent the release of contaminants that may impact on downstream water quality
- emergency action plans and response procedures to address any unplanned critical failures or impacts from natural disasters
- feral animal control and good practice in water management to prevent the increase or spread of disease vectors
- notifying of any potentially contaminated sites for possible listing on the Environmental Management Register
- remediating any contaminated land on-site, prior to returning the land to the underlying landholder
- project related traffic increases would be minimised by transporting staff to and from the site by bus
- the Capricorn Highway would be upgraded to include turning lanes to ensure safety for traffic entering and leaving the mine site.

Refer to sections 5.6 and 5.7 of this report for further details about the proposed air and noise mitigation measures.

5.11.3 Major issues raised in submissions

There were no major health and safety issues raised in submissions on the EIS.

5.11.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the health and safety aspects of the project. The EIS adequately described the potential health and safety impacts of the project on the community values and proposed impact mitigation and management measures to minimise these impacts, including emergency action plans and response procedures.

There are no specific health and safety recommendations for the project.

5.12 Economy

Section 4.12 of the EIS described the local, State and national economic aspects of the project. Section 4.12.1 of the EIS described the regional and socio-economic profiles potentially affected by the project. Section 4.12.2 of the EIS outlined the potential economic impacts of the project and proposed mitigation measures to address the impacts.

5.12.1 Description of the economic profile

The project lies within the Central Highlands region which covers approximately 60,000km^2 and covers a significant portion of the Bowen Basin. The two main towns in the Central Highlands are Emerald and Blackwater. The region contributes significantly to the Queensland and Australian economies, predominantly through mining and agriculture. Other activities such as ownership of dwellings and construction also contribute significantly to the economic activity of the Central Highlands region.

In 2011 to 2012, the Central Highlands regional economy contributed $6.03 billion to the gross State product (GSP) of $265.32 billion. Mining accounted for 70% of the gross regional product (GRP) in that year, contributing $3.2 billion to the economy.

Based on the Australian bureau of statistics data, a total of 1,970 businesses in the Central Highlands region were actively trading in 2011 to 2012. There were 38 mining businesses in Central Highlands in 2011 to 2012, representing 2% of the total number of businesses in the region.

As at June 2013, there were 22 mining projects in various stages of development across the Central Highlands region, including new projects and expansions of existing mines, with a total estimated investment of $9 billion. In addition to mining projects, coal seam gas resources are currently being developed in the region.

The EIS provided an overview of the trends in the relevant economic indicators of the Central Highlands region, including population size and structure, regional employment, income levels, education attainment, housing and infrastructure and land values. According to Queensland Treasury projections in 2011, the Central Highlands population is projected to reach 50,742 by 2031, with an average annual rate of growth of 2.4%, whilst Queensland is expected to have an average annual growth rate of 1.8%.

5.12.2 Potential impacts and proposed mitigation measures

The project has a total determined resource of 202.1Mt of coal, to be mined at an eventual rate of up to 2.3Mt/y of ROM coal from open-cut operations and up to 5.7Mt/y ROM coal from underground operations, with an expected mine life of 21 years.

During the construction period, the project is predicted to add $852 million to GSP, of which nearly 50% would be retained in the Central Queensland regional economy. Over 1,475 jobs would be supported during the construction phase, with the majority of these being outside the Central Queensland region.

During mine operations, the project is predicted to add $3,826.5 million to GSP, of which nearly 50% would be retained in the Central Queensland region. The operational phase would support 1,082 jobs, of which over 60% would be in the Central Queensland region.

The project would also use 473ha of land presently used for grazing and non-irrigated agriculture, although the vast majority of this land would be rehabilitated and returned to prior uses after mine closure. The cost-benefit analysis has included the foregone income from this alternative land use as a cost of the project, valued at $519,000 in net present value (NPV) terms.

After considering the social, environmental and economic benefits and costs, the cost-benefit analysis demonstrated that the project would result in a net increase in social welfare in the order of $1,911 million in NPV terms.

The project is consistent with the development of the region in terms of its competitive advantage in coal production. The analysis shows that moving from grazing to coal mining produces a significant increase in the value of economic output.

Although housing availability is a key mining community concern, Emerald has no obvious development constraints, since there is good availability of appropriately zoned vacant-blocks and a solid number of existing houses available for purchase or rent.

Some existing land users would be negatively affected by the project in that their current land use is discontinued and they would potentially face noise, dust and visual amenity impacts. However, these impacts are mitigated through purchase of properties and additional actions to prevent, or alleviate, actual impacts.

Local businesses have been under pressure since the global financial crisis and subsequent mining industry downturn, and are therefore actively seeking new commercial opportunities. These businesses would be encouraged to tender for supplies and services during both project construction and operation. The proponent would liaise with the industry capability network and local business groups, such as the Central Highlands development corporation, to facilitate participation with local suppliers. The proponent proposed to adopt the Queensland Resources and Energy Sector Code of Practice for Local Content to facilitate local industry participation.

The proponent is openly committed to local employment. However, low unemployment levels in the region, together with a projected demand for skilled workers from the broader resources industry throughout the State, is expected to lead to a skills shortage for the project. Unskilled and semi-skilled people working in the region's traditional agricultural and forestry industries may not have the range of experience or skills that can be directly transferrable to the mining industry. The proponent has provided a commitment of undertaking regional training, resulting in people taking up mining positions such as plant operators and tradespersons' assistants.

5.12.3 Major issues raised in submissions

No major issues related to the economic impact assessment were raised in submissions on the EIS.

5.12.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the economic impact assessment. The project would make a significant positive contribution to the regional and State economies. Potential negative economic impacts would be managed and mitigated to alleviate their actual effects on the local and regional economies. Economic analysis showed that moving from grazing (the current land use) to coal mining produces a significant increase in the value of economic output, consistent with economic and regional development strategies.

Recommendation

The proponent should continue to liaise with relevant stakeholders when finalising the Queensland Resources and Energy Sector Code of Practice for Local Content for the project.

5.13 Hazard and risk

Section 4.13 of the EIS described the hazards and risks associated with the project. Section 4.13.1 of the EIS provided a description of the values related to people and property that may be affected by the project. Section 4.13.2 of the EIS included a description of the potential hazards and risks that could impact on the identified values, and proposed mitigation measures to address the potential impacts.

5.13.1 Description of values

The values related to people and property that could be affected by the hazardous materials and operations associated with the project include the following:

- the air and acoustic environment in the context of health and wellbeing
- Indigenous and non-Indigenous cultural heritage values in the context of unexpected finds during project construction and operations
- agricultural productivity and the economic value of the land after mining has been completed
- surface water and groundwater supply and quality after mining has been completed
- visual amenity of the natural landscape
- community health and safety
- workforce health and lifestyle values.

5.13.2 Potential impacts and proposed mitigation measures

A preliminary hazard analysis identified the following potential hazards during the construction, operation and decommissioning phases of the project that could impact on the identified values:

- transporting, storing, handling and using hazardous chemicals and dangerous goods
- operating light and heavy vehicles
- staff contact with regulated site water storages
- staff exposure to sources of heat, pressure and electricity
- staff contact with ignition sources
- staff use of, and contact with, explosives
- staff contact with potentially harmful wildlife
- accidents associated with site clearing and rehabilitation activities
- pit wall and spoil dump instability or mass failure
- staff interaction with the mining pit, regulated dams, CHPP, ROM stockpiles, spoil dumps, coal conveyors and truck loading and unloading
- noise and dust nuisance at identified sensitive receptors and affected places respectively
- pipeline failure resulting in contaminated water entering the receiving environment
- staff injury when dismantling and removing site infrastructure
- flooding and cyclone related hazards.

The mitigation measures proposed to control the identified hazards include the following:

- progressive rehabilitation and biodiversity offsets
- quality blasting products, correctly designed shots and blasting clearance zones
- geotechnical studies prior to constructing infrastructure
- appropriate engineering designs of the pit, spoil dumps and regulated dams

- exclusion zones around unsafe infrastructure areas and steep slopes
- noise attenuation on mining equipment
- dust suppression spraying on stockpiles and haul roads
- adequate compensation for potentially affected landholders
- disposing rejects in engineered cells below ground level
- having operating procedures in place for engineered structures
- conducting annual inspections of engineered structures
- conducting regular inspections and maintenance of project infrastructure
- constructing site water management infrastructure to prevent contaminated water run-off
- implementing surface water and groundwater monitoring programs
- designing final voids to be above the probable maximum flood level
- constructing firebreaks around the mining lease boundary and potential ignition sources
- installing fire extinguishers in all vehicles
- conducting a final contaminated land assessment and implementing remedial actions, if required
- conducting staff induction and safety awareness training
- transporting, storing, handling and using hazardous chemicals according to relevant standards
- implementing relevant Australian standards and best practice health and safety procedures
- implementing emergency response procedures.

A risk assessment of each hazard found that with the implementation of control measures, all but two risks were reduced to a medium or low risk rating. Table 5-17 shows the two risks that were assessed as retaining a high risk rating with the implementation of control measures.

Table 5-17 Project-related hazards with a high risk rating

Hazard	Potential impact	Control measure
Operating light and heavy vehicles and equipment	Personal injury	Implement health and safety procedures
Dismantling and removing infrastructure during decommissioning	Death or personal injury	Implement operational procedures, training, emergency response and first aid

Source: Table 4.160 of the EIS

An integrated risk management plan (IRMP) would be developed to manage the risks identified with the construction, operation and decommissioning phases of the project. The IRMP would include a detailed operational hazard analysis and construction and decommissioning safety assessments to identify additional control measures to further reduce the risk rating of potential hazards, including the high risk rating of the two hazards identified above.

Independent hazard audits would also be conducted to identify previously unrecognised hazards and early recognition of below standard performance in areas such as management controls and the maintenance and testing of equipment.

5.13.3 Major issues raised in submissions

The QFES advised that due to the distance to the project site, project emergency personnel must be sufficiently trained and equipped to be self-sufficient to manage and control any incident until the QFES response arrives. QFES requested that an agreement between the proponent and QFES be developed to implement safety and health management systems. QFES also requested that the emergency response plan include: contact details for key stakeholders in case of a disaster or emergency; details of possible helicopter and fixed wing landing sites; treatment plans for injured workers; and details about entry to the site in the event of an emergency. The QPS also requested the proponent to liaise with them when preparing the emergency response plan for the project. In response, the proponent agreed to undertake a collaborative process for developing the emergency response plan and comply with the requirements at the appropriate time, and to use relevant guidelines in future hazard and risk assessment for the project. EHP reviewed the additional information provided by the proponent and is satisfied with the proponent's commitment to liaise with relevant stakeholders during the preparation of the emergency response plan.

5.13.4 Conclusions and recommendations

The EIS adequately addressed the requirements of the final TOR with regard to the hazard and risk aspects of the project. A number of potential project hazards were identified that could impact on the values of people and property. The proponent has proposed a range of mitigation measures to reduce the risk of project hazards and has established procedures to address the project hazards with a high risk rating.

Recommendation

The proponent should liaise with QFES, Queensland Ambulance Service, QPS and any other relevant stakeholders during the preparation and implementation of the emergency response plan for the project.

6 Recommendations about the suitability of the project

In this EIS process the detailed information compiled by the proponent about the proposed Taroborah Coal Project, and the potential impacts of the project on the identified environmental values have been assessed by representatives of the Australian, state and local governments, industry, interest groups and members of the public through an open, public review process. The proponent has also met the EIS process requirements including for notification, responding to comments and submissions as required by chapter 3 of the EP Act.

The EIS has complied with the requirements of the final TOR, and has outlined a range of mitigation measures to avoid, minimise or offset adverse environmental, social and economic impacts. The majority of issues were covered satisfactorily in the EIS and in the proponent's responses to the submissions in the supplementary report. However, a number of additional actions are required to be completed, including the completion of various field surveys, reports, plans and agreements to formalise the proponent's commitments in the EIS. These actions have been clearly outlined in the recommendations under each section of this EIS assessment report and should be fully implemented in consultation with relevant stakeholders.

Nevertheless, no issues of sufficient magnitude have been identified during the EIS process that would prevent the project from proceeding. Consequently, the project has been determined to be suitable to proceed.

7 Recommendations for conditions of any approval

7.1 Environmental authority approval

After the EIS process has been completed, the proponent would apply under chapter 5 of the EP Act for an environmental authority to authorise the mining activities for the Taroborah Coal Project. As required by section 59(d) of the EP Act, this report includes recommended draft environmental authority conditions in Appendix 1. EHP's model mining conditions (EHP, 2013) and the model conditions for regulated structures (EHP, 2013) were considered in the development of the recommended draft environmental authority conditions. All recommended conditions are considered necessary and desirable for the regulation of identified and potential environmental impacts determined in this assessment. Some of the recommended conditions are incomplete and would require finalisation prior to issue of the draft environmental authority.

7.2 Mining lease approval

After the EIS process has been completed, the proponent would apply under the *Mineral Resources Act 1989* to DNRM for a new mining lease on which the proposed mining activities would largely be conducted. The mining lease application is subject to its own process of public notification, which would take place after the EIS process for the project had been completed. Consequently, DNRM would prepare any conditions of approval after the proponent has applied for the new mining lease, and the public notification period has been completed.

7.3 Australian government approval

The proponent has referred the project to the Australian government Department of the Environment, which determined the project to be a controlled action, requiring approval under the EPBC Act. This report includes recommendations in Appendix 2 that should be completed by the proponent, before the Commonwealth Minister can make a decision about the approval. A copy of this report will be given to the Commonwealth Minister to assist with making a decision about the approval of the project and any conditions that should apply under Part 9 of the EPBC Act.

8 Approved by

Lindsay Delzoppo	3 March 2015
Signature	**Date**

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