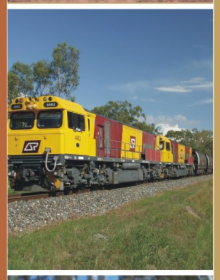
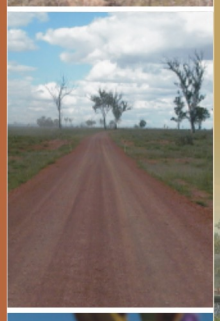
QUEENSLAND RAIL

Queensland Rail

ENVIRONMENTAL IMPACT





Northern Missing Link (North Goonyella to Newlands)

Volume 1

Environmental Impact Statement

GHD

February 2006

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Glossary

AADT	Annual Average Daily Traffic
AHD	Australian Height Datum
ANZECC	Australia and New Zealand Environment and Conservation Council
ATP	Exploration permits for petroleum
CHMP	Cultural Heritage Management Plan
BMA	BHP MITSUI Alliance Coal Pty Ltd
CO	Carbon Monoxide
COAG	Council of Australian Government
CoG	The Coordinator-General of the State of Queensland
CWP	Construction Work Procedures
DA	Development Application
DBCT	Dalrymple Bay Coal Terminal
DEH	Department of Environment and Heritage
DLGP	Department of Local Government and Planning
DMR	Department of Main Roads
DNRM	Department of Natural Resources and Mines
DPI&F	Department of Primary Industries and Fisheries
DSDI	Department of State Development and Innovation
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environment Management System
EO	Environmental Officer
EP Act	*Environmental Protection Act 1994*
EPA	Environmental Protection Agency
EPBC	*Environmental Protection and Biodiversity Conservation Act* 1999
EPP	Environmental Protection Policy
EPC	Exploration permits for coal
ERA	Environmentally Relevant Activity
ESD	Ecologically Sustainable Development

ESA	Equivalent Standard Axles
GOC	Government Owned Corporation
IAS	Initial Advice Statement as defined by Part 4 of the *State Development & Public Works Organisation Act 1971*
IDAS	Integrated Development Assessment System
IPA	*Integrated Planning Act* 1997
Mtpa	Mega tonnes per annum
NES	National Environmental Significance
NML	Northern Missing Link
NOx	Oxide of Nitrogen
NTRB	Native Title Representative Body
PCQ	Ports Corporation of Queensland
PVMP	Property Vegetation Management Plan
QR	Queensland Rail
RE	Regional Ecosystem
REDD	Regional Ecosystem Description Database
RIA	Road Impact Assessment
SDPWOA	*State Development & Public Works Organisation Act* 1971
SEIA	Social and Economic Impact Assessment
TOR	Terms of Reference as defined by Part 4 of the *State Development and Public Works Act 1971*
VMA	*Vegetation Management Act* 1999

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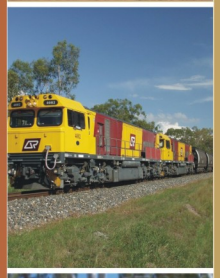

Northern Missing Link (North Goonyella to Newlands)

Executive Summary

Environmental Impact Statement

GHD

February 2006

Executive Summary

The Central Queensland coal rail system currently includes four rail systems – Moura, Blackwater, Goonyella and Newlands, and five coal export ports – two at Gladstone (RG Tanna and Barney Point); two at Hay Point (Dalrymple Bay Coal Terminal (DBCT) and Hay Point Services Coal Terminal (HPSCT)), and one at Abbot Point. The proposed Northern Missing Link (NML) rail line will connect the existing Newlands and the Goonyella railway systems near the coalmines of North Goonyella and Newlands in the North Bowen Basin, Central Queensland (Figure 1). The construction of the NML will assist in providing relief to the coal transportation task on the Goonyella system.

The entire Northern Missing Link project has been divided into three distinct sections:

» Construction of a rail link between North Goonyella and Newlands (the Northern Missing Link) (Greenfield Development);

» Track upgrade works between Newlands and Abbot Point (Brownfield Development); and

» Train turning infrastructure for the Goonyella System (Brownfield Development).

The impact assessment for this Environmental Impact Statement (EIS) is only focused on the Greenfield Development section of the Northern Missing Link between North Goonyella and Newlands (being approximately 69 km long section of single line electrified railway with three passing loops to be contained within a nominal 60 metre wide corridor). The full project is proposed to be constructed over a number of stages spanning 15 to 20 years with the volume of coal being transported increasing progressively over that period (coal volume increasing from 3 Mtpa to approximately 35 Mtpa across the Link with corresponding train numbers varying from 5 trains per day up to an approximate average of 29 trains per day).

Construction of the Link may commence late 2006 with an 18-24 month construction period, however this timing may vary significantly depending on coal demand, coal system master planning considerations, commitment from mine owners, resolution of funding, financing, pricing and regulatory issues. Construction of the NML will require an average work force of approximately 200 personnel. Movement of construction materials and equipment will be via a combination of road and rail transport, utilising the main road networks in the region. It is envisaged that gravel and ballast materials will be sourced locally from existing quarries and transported via road and rail. Water will likely be sourced from bores within the rail corridor.

Queensland Rail is the Proponent for this project. It operates its business within a corporate Environmental Management System (EMS) with the Environmental Policy being a key component. This policy commits QR to applying sound environmental management practices based on the principles of Ecologically Sustainable Development (ESD).


Legislative Framework

The Northern Missing Link Project (North Goonyella to Newlands) was declared a significant project by the Queensland Coordinator-General (CoG) pursuant to Section 26 of the Queensland *State Development and Public Works Organisation Act 1971* (the SDPWO Act). This declaration requires QR to prepare an Environmental Impact Statement (EIS) for the project under the SDPWO Act. This process removes duplication with the Commonwealth *Environmental Protection and Biodiversity and Conservation Act* 1999 (EPBC Act) and streamlines approval processes under the Integrated Planning Act (IPA) 1997. A referral under the EPCB Act was submitted to the Department of Environment and Heritage and the project declared 'Not a Controlled Action', therefore an EIS under the SDPWO Act needs to be prepared for the project.

Under *Chapter 2, Part 6* of IPA a Minister or a local government may *Designate Land for Community Infrastructure*. Development under a *designation* is "exempt from assessment" against requirements of local government planning schemes. As such no approvals will be required from local government. It is the intention of the Minister for Transport and Main Roads to *Designate Land for Community Infrastructure* for this project.

The decision-making authority for this project is the Coordinator-General. Key advisory agencies are listed below:

- Environmental Protection Agency;
- Department of Local Government and Planning
- Department of Primary and Industry;
- Department Energy;
- Department of Communities;
- DATCIP;
- Department of Natural Resources and Mines;
- Department of Main Roads;
- Department of Energy;
- Department of Housing;
- Department of Emergency Services; and
- Queensland Transport.

Project Alternatives

A number of alternatives were assessed to determine the preferred method of rail system expansion in the Goonyella system. These included:

- a 'Do Nothing' alternative;
- a rail link between the Hail Creek Mine Rail Spur and the Newlands system; and
- a rail link between North Goonyella and the Newlands system.

Assessment of these alternatives indicated that the North Goonyella to Newlands link was the preferred alternative. A number of additional alternative alignments were developed to accommodate mining and cattle property infrastructure and these were assessment against environmental, social, cultural, economic and engineering aspects to determine the preferred alignment (Figure 2).

Land Uses, Infrastructure, Topography, Geology and Soils

The proposed rail corridor traverses through three local government areas (Belyando, Nebo and Bowen) and seven beef cattle properties. The land is mostly zoned as Rural A, being used for beef cattle grazing with coal mining in the close proximity. A number of mining-related leases and exploration permits exist within the project area with the rail alignment designed to avoid sterilization of coal seams. The Sunwater pipeline will be crossed at two locations and the Enertrade North Queensland Gas Pipeline is located west of the rail corridor. The proposed rail line also crosses three stock routes (all will be retained) and two roads (Suttor Developmental Road (flashing light protection) and the Cerito-Elphinstone Road (currently under construction and to be grade separated)).

The project area includes a number of natural environmental features including remnant vegetation, minor watercourses and the Leichhardt Range. The topography of the project area ranges from flat basaltic and clay plains to undulating sandstone rises/tablelands and rocky basaltic plugs. The land systems along the proposed rail corridor are varied, consisting of weathered basalts, clay and alluvial plains and the main soil types crossed by the proposed rail corridor include finely structured self mulching clays, yellow, brown and red duplex soils, massive earths and deep sandy soils.

The proposed railway passes through relatively flat topography and will have minor impacts including a slight increase in water and wind erosion of soil and loss of topsoil during the construction phase resulting in a slight reduction in water quality. Mitigation measures that consider the climatic conditions will be implemented to reduce these impacts.

Water Resources

The rail corridor crosses a number of small ephemeral creeks and drainage lines and is adjacent to several farm dams and turkey nest storage dams used for stock water supply. Generally the existing water quality is characterised by high turbidity levels due to high erosion rates and salinity levels that are within national guideline limits. Groundwater quality is affected by the coal seams and tends to have high salinity and magnesium levels. Appropriate sediment and erosion control techniques as outlined in *Soil Erosion and Sediment Control-Engineering Guidelines for Queensland Construction Sites* (1996) will be implemented for the project. The construction and operation of the proposed railway should have minimal impact with proposed mitigation measures in place.

Nature Conservation (Flora and Vegetation, Fauna & Aquatic Biology)

The proposed rail corridor is located within the Brigalow Belt Bioregion. It is characterised by flora and fauna species common to open woodlands with the majority of the project area cleared for cattle grazing and only small areas of intact woodlands located mainly on poorer quality soils associated with ridgelines and escarpments. All of the vegetated areas are subject to grazing pressure by cattle and the diversity and quality of the vegetation reflects this disturbance. There are no conservation or reserve areas within the project area.

Twenty regional ecosystems (RE) are located within or adjacent to the rail corridor with the proposed rail corridor crossing four Endangered REs (28.56 ha to be cleared), two Of Concern REs (16.54 ha to be cleared) and six Not of Concern REs (61.92 ha to be cleared) that are listed under the Vegetation Management Act and three endangered ecological communities listed under the EPBC Act including communities of Brigalow (25.61 ha to be cleared) and Bluegrass (17.47 ha to be cleared). One threatened flora species, *Dichanthium queenslandicum* (King Bluegrass) was observed at two locations within the Bluegrass communities in the northern sections of the rail

corridor. This species is listed as vulnerable under the *Environmental Protection and Biodiversity Conservation Act* 1999 and vulnerable under the *Nature Conservation Act* 1992.

The majority of the proposed rail corridor is located within existing cleared and degraded areas and has been chosen to avoid disturbance to large areas of remnant vegetation. The construction and operation of the rail corridor will involve the removal of some remnant vegetation but given the level of previous and current disturbance regimes will not adversely affect the long-term viability of any of the vegetation communities in the area. The small loss of the endangered Regional Ecosystems, EPBC Endangered Ecological Communities and habitat for *Dichanthium queenslandicum* is not considered to represent critical habitat to the on-going survival of these communities or taxa.

Four weeds declared under the *Land Protection (Pest and Stock Route Management)* Act 2002 are located within the study area, with the most significant weed in the project area being Parthenium (*Parthenium hysterophorus*), this weed is also declared as a weed of national significance.

A total of 317 fauna species have been previously recorded and 121 observed during field surveys within the project area, of these nine are threatened (including Squatter Pigeon, Ornamental Snake and Black-necked Stork) and have conservation status under State and Commonwealth legislation. In addition, a further 14 are listed as migratory species and are protected by international policies. Six introduced species were observed along the corridor. The project does not support significant habitat for any of the threatened or migratory species and it is not considered to have a significant impact or any threatened or migratory species that inhabit or utilise the area.

There is limited information available on the aquatic ecology of the study area. The waterways and farm dams present along the corridor are likely to be providing habitat for small fish and crustaceans, as well as migratory and water birds. No steam diversions are planned and construction activities are likely to undertaken predominately in the long dry season so impacts are expected to be low with appropriate mitigation measures.

Mitigation measures to minimise impacts to flora and fauna include:

» Minimising clearing of remnant vegetation to the minimum necessary to enable the safe construction, operation and maintenance of the railway line;

» Preparation of a Weed Management Plan (WMP); and

» Provision of culverts with suitable habitat to allow small fauna such as frogs and snakes, especially the Ornamental Snake the ability to cross beneath the rail corridor.

Historic and Cultural Heritage

The preferred rail alignment crosses land pertaining to three indigenous groups – the Birri group, the Wiri (#2 and #3) groups and the Jangga group. Searches of the Cultural Heritage Database and Register (DNRM) and systematic cultural heritage surveys of Native Title claim areas within the project area were undertaken by qualified archaeologists, in conjunction with representatives of the respective traditional owners together with field inspections by the archaeologist and respective traditional owners in each of their areas. Traditional owners were also consulted to establish an oral history of the region. A number of cultural sites have been identified in the area and Traditional Owners have indicated that prior to construction activities commencing, representatives were to salvage isolated artefacts along the preferred alignment. The proposed rail alignment has been located where

possible to avoid sites of significance or sites unable to be salvaged. A number of key measures will also be implemented to address impacts on the local and regional communities. Cultural Heritage Management Plans (CHMP) have been prepared for the project.

An assessment of the non-indigenous cultural heritage did not identify any items of significance along the preferred alignment.

Social and Economic Environment

The local and regional community affected by the project includes the seven directly affected property landowners (all managing beef cattle), their associated families and/or farm employees, surrounding properties and the local coal mining towns of:

» Glenden (Nebo Shire);

» Moranbah (Belyando Shire);

» Nebo (Nebo Shire); and

» Collinsville (Bowen Shire).

Employment in the region is predominately in the agricultural and mining industries. There is currently a trade and operator skills shortage in the region as a result the boom in the coal industry which is also resulting in a shortage of accommodation at all local towns. Community and public services infrastructure are well represented within the region with the established coal centres of Collinsville and Moranbah providing the highest level of community and infrastructure services. The proposed additional construction activity will increase pressure on accommodation, however the majority of the work force will reside in construction camps close to the site. Some additional business activity will be generated in the towns. Implementation of strategies to interface with the community is planned.

Consultation with landowners directly affected has been undertaken and their impacts documented together and measures are proposed to be put in place to manage these impacts. Key measures include:

» Provision of a phone number to QR train operations to allow landowners to efficiently manage cattle movement across the rail line.

» Financial compensation for the replacement or duplication of infrastructure (fencing, stock yards, water points).

» Provision of designated rail-crossing points (combinations of rail bridges and occupational crossings) across the affected properties to allow cattle and vehicle movement.

Air Quality

The air quality in the region is typical of a rural area in central Queensland. There are no nearby major industrial or population based sources of air quality deterioration. Air sensitive receptors within the project area include property homesteads, cattle yards and workers cottages. Two homesteads are located within two kilometres of the preferred alignment.

Dust from stock movement, working cattle yards and high wind is the current main source of particulates within the study area. As the land is primarily utilised for grazing, it is largely cleared and is therefore subject to wind erosion.

Dust will be primary air quality impact and measure has been identified to mitigate this impact.

Noise and Vibration

The proposed rail corridor is located within a rural setting and noise sensitive and vibration receptors within the project area include adjacent homesteads and workers cottages. Two homesteads are located within two kilometres of the preferred alignment. The existing background noise of the project area is consistent with that of most rural areas, consisting primarily of insect, bird and wind noise, with occasional machinery noise from activities at homesteads.

Increased noise will be generated during both the construction and operational phases of the project. Mitigation measures have been identified and noise levels are anticipated to remain below guideline levels.

Waste

There are a number of activities identified that are associated with generation of solid, liquid, gaseous and hazardous wastes during the construction phase of the project. The potential exists to recycle or reuse a large proportion of the waste material generated by these activities. This will effectively reduce the cost of disposal and volume of waste sent to landfill over the period of the project. Strategies for dealing with the waste have been identified so as to minimise waste generation and disposal.

Traffic, Transport and Access Arrangements

The proposed transport routes for the project are shown below.

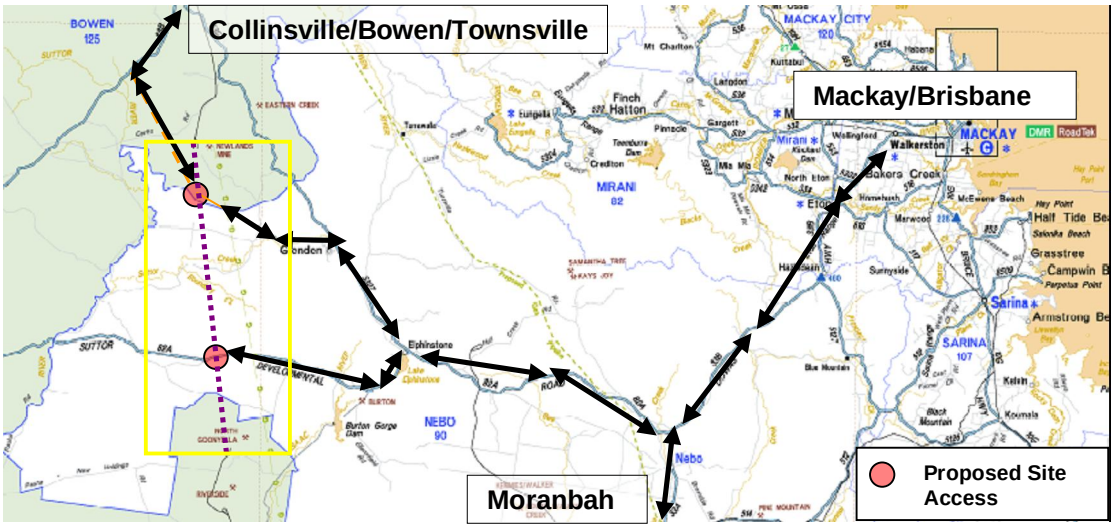

Figure 3 Proposed Transport Routes

A summary of the existing traffic data for these routes shows a high percentage of heavy vehicle traffic in the region, which has a higher growth than the growth of general AADT. Anticipated volumes of material, supply locations, transportation mode and routes to be used associated with the construction phase have been identified together with impacts (including deterioration of pavement and intersections). A pavement impact scoping assessment has been undertaken using the current information and this indicates that detailed pavement impact assessment will need to be undertaken for the more lightly trafficked roads away from the Peak Downs Highway and Bowen Development Roads at the time of detailed design. The intersections at Sutter Development/ Collinsville-Elphinstone Roads and Collinsville – Elphinstone/Newlands Mine Roads will also need to be checked. These items will need to be agreed with the MRD and local authorities prior to construction commencing.

The proposed railway will cross two public roads. Grade separation is proposed for Cerito-Elphinstone Road (currently under construction) and flashing lights with bitumen approaches will be used on the Suttor Development Road. This level of protection is confirmed as more than adequate using the ALCAM software (currently used by QT, QR, MRD and Local Authorities and used to determine the works required to comply to achieve compliance with AS 1742.7). The software will also be used to review the level of protection at road/rail public crossing

downstream of the Link works and to assist in determination of any future works that may be required to be undertaken as a consequence of operation the NML.

Risk and Hazard

Risks to the health and safety of employees, the public and the environment will be present during the construction and operation of the rail link. A risk assessment has been undertaken as part of the planning stage of the project. This has identified the risk present are common to all "Greenfield" track construction projects and the risk level is generally low to moderate. There are no identified "Extreme" or "High" risks to track construction, persons or the environment.

Potential risks and hazards have been identified at a high level and a detailed and project specific risk assessment will be completed as part of the rail Construction Safety Management Plan. This will be prepared in accordance with appropriate parts of *AS/NZS Risk Management Standard 4360:1999* and the main QR risk assessment standards.

Similarly, prior to the commissioning of the rail line, a risk assessment for the operation and maintenance of the NML will be undertaken.

Standard QR Emergency Management Plans will be implemented during the construction and operation phases of the project. The construction contractor will liaise with State Emergency Services to develop plans for emergency medical response, fire fighting and first aid matters.

Environmental Management

Environmental Management Plans have been prepared in response to the potential impacts identified in the environmental assessment.

Conclusions and Recommendations

The Northern Missing Link project has been identified as a critical path to facilitate the export of thermal and coking coal, and to allow the Queensland Government to continue its commitment in developing rail and port capacity ahead of increasing demand for domestic and export coal. It will facilitate a rail linkage allowing coal trains currently operating on the Goonyella system and using the port facilities at Hay Point and Dalrymple Bay, to unload at Abbot Point, near Bowen. Likewise, coal trains loading at Newlands and presently using Abbot Point will have the option of unloading at Dalrymple Bay. It is expected that the project will foster new mines in the region, however its main function will be to provide a linkage from mines in the greater Goonyella area to utilise an additional port on a regular basis as well as providing a strategic emergency link if the existing Goonyella railway or associated ports at Dalrymple Bay and Hay Point are closed or experiencing capacity restrictions.

The major issues and potential impacts identified in this EIS include the following:

- disruption to property management, including property access, increased safety risk, restrictions to cattle and vehicle movements;
- introduction and spread of weed species along the alignment;
- loss of threatened ecological communities;
- loss of habitat for threatened flora and fauna species;
- disturbance to areas of cultural significance;
- benefits to local, regional and state economy; and
- temporary increase in traffic to the local road network.

This impact assessment concludes that after implementation of the proposed mitigation measures to minimise impacts, the benefits presented by the Northern Missing Link project can be realised without undue risk to environmental, social and cultural values of the project area.

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1. Introduction

1.1 Project Description

Queensland Rail (QR) is substantially investing in rail infrastructure over the next five years to meet the forecasted growth in the coal sector.

The Central Queensland coal rail system currently includes four rail systems – Moura, Blackwater, Goonyella and Newlands, and five coal export ports – two at Gladstone (RG Tanna and Barney Point); two at Hay Point (Dalrymple Bay Coal Terminal (DBCT) and Hay Point), and one at Abbot Point. The Moura and Blackwater systems export through the Gladstone port, the Goonyella system through the Hay Point and DBCT ports, and Newlands through Abbot Point (Figure 1-1).

A feasibility study is currently being prepared by QR which focuses on the at-capacity Goonyella system and on determining the preferred method of rail system expansion to meet mine requirements for increased export of thermal and coking coal from this system. This feasibility study has been divided into three distinct sections:

» Construction of a rail link between North Goonyella and Newlands, commonly referred to as the Northern Missing Link (NML) (Greenfield Development);

» Track upgrade works between Newlands and Abbot Point (Brownfield Development); and

» Train turning infrastructure for the Goonyella System (Brownfield Development).

The proposed NML will be situated in the Central Queensland Bowen basin coalfields, directly west of Glenden, approximately 180 km inland of Mackay (shown in Figure 1-2). The route will travel 69 km, connecting the existing railway infrastructure at North Goonyella and Newlands. The rail corridor will be nominally 60 m wide and include three passing loops. As part of the project, the following additional provisions will be required between North Goonyella and Newlands:

» Occupational and stock crossings;

» Maintenance access roads;

» River and creek crossings;

» Suttor Development Road level crossing; and

» Cerito-Elphinstone Road overbridge.

This Environmental Impact Statement (EIS) is focused on the need, for, or otherwise on the development of the rail link between the coalmines at North Goonyella and Newlands to support the projected demand for coal export. The EIS has been produced to comply with Final Terms of Reference (ToR) for and Environmental Impact Statement as directed by the Coordinator General (October 2005) (refer to Appendix A). Table 1 provides a summary of the ToR objectives and where relevant sections are addressed in this EIS. A table outlining the full ToR requirements and where addressed is provided in Appendix B.

Table 1 Summary of Terms of Reference Objectives for this Environmental Impact Statement

Terms of Reference Objective for the EIS	Relevant EIS Sections	EIS Description
Provide a basis for understanding the project	Sections 1.1, 1.2, 2.1 and Chapter 3.0	The EIS provides relevant information on the need for the project and a description of all aspects of related to construction and operation of the project.
Legislative and policy provisions	Section 1.6	All legislative and policy requirements are described a list of relevant approvals, license and permits provided for all aspects of the construction of the project.
Alternatives to the project and preferred solutions	Section 2.3	Three alternatives were assessed for this project, including a 'Do Nothing' alternative. The assessment outlined the preferred alternative to be the NML and the preferred alignment based on environmental, social, cultural, engineering and economic considerations.
Description of existing environment	Chapter 4.0	The existing environment (land use/infrastructure, water resources, climate, nature conservation, cultural heritage, social and economic, air, noise, traffic, waste and risk/hazards) that will be affected by the project, both on and off site has been described.
Potential impacts to the existing environment and measures to mitigate adverse impacts	Chapter 4.0	Potential impacts, both adverse and beneficial, to the existing environment have been discussed and where possible measures and recommendations provided to avoid or mitigate adverse impacts provided.
Environmental Management Plans (EMP)	Sections 5.8.1 and 5.8.2	Measures and recommendations to minimise potential adverse impacts during construction and operation have been provided in a series of EMPs for each aspect of the environment.

Figure 1-1 Locality

Figure 1-2 Project Area

1.2 Project Objectives

With the Port of Hay Point facility approaching capacity, the project will result in a rail linkage allowing coal trains, presently operating on the Goonyella system and currently using the facilities at Hay Point Darymple Bay, to unload at Abbot Point, near Bowen. Likewise, coal trains loading at Newlands and presently using Abbot Point will have the option of unloading at Darymple Bay. It is expected that the project will foster new mines in the region as well as provide a strategic emergency link if the Goonyella line is closed.

In addition to the construction of the railway, additional infrastructure will include upgrades to the Newlands and Goonyella rail systems. The full NML project will extend through to the Abbot Point Coal terminal, with further infrastructure works to include:

- Isolated sections of new rail infrastructure to service Goonyella system mines that may wish to export to Abbot Point;
- Brownfield infrastructure within the existing corridor;
- Possible greenfield option for a deviation on the Newlands system; and
- The requirement for a second loop at Abbot Point, which is expected to be contained mostly within the existing operational rail balloon loop at the Port.

This EIS is only addressing the environmental impacts associated within the construction and operation of the rail link section of the project (greenfield development). Other environmental studies are being undertaken to assess impacts associated with brownfield development on the Goonyella and Newlands rail lines.

A number of alternatives were assessed to determine the preferred method of rail system expansion in the Goonyella system. These included a rail link between the Hail Creek Mine Rail Spur and the Newlands system. Further information on the alternatives are provided in Section 2.3.

Construction of the NML rail corridor is scheduled to commence in late 2006 and is expected to take between 18-24 months from commencement. This timing may vary very significantly depending on coal demand, coal system master planning considerations, commitment from mines, resolution of funding, finance, pricing and regulatory issues.

QR has already completed a Missing Link rail alignment options study in 1992. This study identified the requirement for a rail link between the Goonyella and Newlands systems and identified a number of suitable routes to be used for costs estimates (refer to Section 2.3.1). The information and alignment from this study has been incorporated into this project. A number of additional studies have been undertaken to date within the project area, including geotechnical studies, detailed flora and fauna assessment and cultural heritage assessments.

1.3 Project Proponent

The project proponent is QR, a Queensland Government Owned Corporation (GOC). The company generates the majority of its income from the rail freight industry in Queensland, with growth interstate, and is ranked number 90 out of the top 2000 companies in Australia.

QR operates its business within a corporate Environmental Management System (EMS). A key component of the EMS is the QR Environmental Policy (refer to http://www.corporate.qr.com.au/environment/overview/overview.asp) that commits the organisation to:

- "*Applying sound environmental management practices based on the principles of Ecologically Sustainable Development;*
- *Protecting the environment and the prevention of pollution through all phases of our operations;*
- *Providing strategic direction to employees in managing environmental impacts with a focus on continual improvement;*
- *Creating an environmentally aware culture where responsibility is assigned and understood;*
- *Reporting to and communicating with government, industry and community stakeholders;*
- *Providing an appropriate Environmental Management System that reflects our major risks; and*
- *Providing an audit and review framework to ensure that the system is operational, effective and is meeting these requirements".*

Since the establishment of QR's environmental unit in 1995, significant progress has been made in the management of environmental risks on projects and operation. Independent recognition of QR's environmental performance was recently highlighted when the organisation was announced as a finalist in the 2004 Banksia Awards for QR's environmental achievements under the Category of 'Business Environmental Responsibility and Leadership'. QR has also won environmental awards in 2002 and has achieved high rankings in the Reputation Index since 2000, with a ranking at No. 4 for environmental performance in 2003.

QR has commissioned GHD Pty Ltd (GHD) to prepare the EIS for the proposed Northern Missing Rail Link (the project). A list of key personnel involved in the preparation of this EIS is provided below.

Organisation	Personnel	Position/Role
GHD Pty Ltd	Bryce Skarratt	EIS Project Director, Principle Environmental Scientist
GHD Pty Ltd	Lucy Eykamp	EIS Project Manager, Environmental Scientist
GHD Pty Ltd	Rachael Gibson	Social Impact Assessment, Senior Consultant
GHD Pty Ltd	Gavin Nicholls	Traffic Assessment, Senior Engineer
LAMR Pty Ltd	Dr Mike Olsen	Principle Botanist Consultant
Ecoserve Pty Ltd	Andrew Veary	Principle Zoologist Consultant
David Moore and Associates	David Moore	Noise Consultant
Queensland Rail	Bob Stuart	Northern Missing Link Project Director
Queensland Rail	Partha Rangaswamy	Northern Missing Link, Project Manager

1.4 Objectives of the EIS

The objectives of this EIS are as follows:

- To provide information on the proposal and development process to the community and decision makers;
- To comprehensively identify and evaluate all relevant issues associated with the proposal;
- To identify all potential environmental, cultural, social, transport and land use planning impacts of the preferred concept, and recommend infrastructure and facilities needs together with other design and operational measures required to minimise or compensate for adverse impacts and enhanced benefits;
- To consult with the community and relevant stakeholders in the process of identifying, assessing and responding to the impacts of the proposal;
- To identify all necessary licences, planning and environmental approvals; and
- To provide an input to 'State and Australian Government' decision-making processes, assisting with the determination of whether to accept or modify the proposal, approve it with conditions or carry out further studies.

This EIS addresses the environmental impacts associated with construction, operation and maintenance of the rail corridor. Impacts associated with the decommissioning of the corridor will be assessed during the operational phase of the project.

1.4.1 Overview of Legislative Processes

The Northern Missing Link Project (North Goonyella to Newlands) was declared a significant project by the Queensland Coordinator-General (CoG) pursuant to Section 26 of the Queensland *State Development and Public Works Organisation Act 1971* (the SDPWO Act). This declaration requires QR to prepare an EIS for the project under the SDPWO Act.

1.4.2 Methodology for the Environmental Impact Statement

The EIS has been developed in the following phases:

- **Development of Initial Advice Statement:** This phase was completed in May 2005 and included an initial review of available documentation to determine the key issues that should be addressed in the ToR for the Project.
- **Data Collection and Review:** This included collation of all available relevant data for the project area from previous studies, specific to the development of the NML or general studies within the region. New data was also collected where existing references were insufficient.
- **Specialist Studies:** Several specialist studies were undertaken to provide input into the EIS. These included:
  - Noise and acoustics assessments; and
  - Terrestrial flora and fauna surveys.

- **Description of the Existing Environment:** Based on the data collection and specialist studies conducted for the Project, a detailed description of the existing environment was prepared. The purpose of this phase is to provide a baseline from which to determine potential impacts associated with the Project.
- **Description of Potential Environmental Impacts:** The identification and quantification of potential impacts that may result from development of the Project is based on an analysis of known impacts associated with the proposed works, from previous knowledge and experience, and the characteristics of the areas to be impacted. From this analysis potential impacts can be identified and quantified (where possible) and possible mitigation strategies developed where necessary to minimise the potential impacts.
- **Development of the Environmental Management Plan:** The Environmental Management Plan (EMP) details the implementation strategies for the development of the Project to achieve the mitigation strategies identified to minimise potential impacts.

1.5 Public Consultation Process

1.5.1 Overview

The NML has been declared a significant project for which an EIS is required in accordance with the SDPWO Act 1971. Under the SDPWO Act 1971 the community consultation requirements relate to the notice of requirement for an EIS and of draft terms of reference (Division 3, section 29) and public notification of the EIS (Section 33).

GHD has undertaken community consultation that is focused for the EIS, but not the broader consultation for the NML project. QR will be coordinating the public consultation process for the EIS.

1.5.2 Stakeholder Identification

The community consultation methodology was focused on the affected landowners and local Councils directly impacted by the proposed NML. The community consultation methodology was implemented in line with the QR Land Access Protocol for the NML project. The community consultation program was run in conjunction with the consultation phase of the Social and Economic Impact Assessment (SEIA), conducted as part of the EIS.

1.5.3 Involvement of GHD in Community Consultation

QR is currently involved in negotiations with affected landowners for security of land tenure and has met with relevant representatives from the local Government Councils.

GHD built on the exposure QR has provided to stakeholders to date and liaised with QR to ensure a consistent project message is delivered to the community and stakeholders. GHD undertook one-on-one meetings with directly affected landowners and representatives for the three local councils.

1.6 Project Approvals

The decision-making authority for this project is the Coordinator-General. The advisory agencies for this project are listed below:

- Belyando Shire Council;
- Nebo Shire Council;
- Bowen Shire Council;
- Environmental Protection Agency;
- Department of Local Government, Planning, Sports and Recreation
- Department of Primary and Industry;
- Department of Industrial Relations;
- Depart of Communities;
- Department of Aboriginal and Torres Strait Island Policy;
- Queensland Health;
- Department of Natural Resources and Mines;
- Department of Main Roads;
- Department of Energy;
- Department of Housing;
- Department of Emergency Services;
- Queensland Transport;
- Department of Employment and Training;
- Department of Premier and Cabinet; and
- Queensland Treasury.

1.6.1 Relevant Legislation and Policy Requirements

1.6.1.1 Australian Government Approvals

***Environmental Protection and Biodiversity Conservation* Act 1999**

The *Environmental Protection and Biodiversity and Conservation Act 1999* (EPBC Act) establishes a Commonwealth process for environmental assessment and approval of proposed actions that are likely to have a significant impact on matters of National Environmental Significance (NES) or on Commonwealth land. As part of the feasibility study for the project, an EPBC referral was prepared on 15 June, 2005, due to the project's possible interference with the following matters of NES:

- Listed threatened ecological communities;
- Listed threatened species; and
- Listed migratory species.

On 14 July 2005, the Department of Environment and Heritage (DEH) Policy and Compliance Branch deemed the project not a controlled action. This means that approval will not be required under Part 9 of the EPBC Act.

Subsequent to the above, further studies undertaken as part of the EIS process identified additional matters of NES that had not been addressed in the original EPBC referral. A letter outlining these additional matters was prepared and submitted to DEH on 22 September 2005. The additional issues concerning matters of NES included:

- Additional areas of Brigalow not previously identified in the original referral and supporting documents;
- Mosaic of Bluegrass communities in the northern section of the alignment and presence of the vulnerable *Dichanthium queenslandicum* (King Bluegrass) within these communities; and

» Presence of Ornamental Snake (*Denisonia maculata)* habitat along sections of the alignment.

Correspondence was received from DEH on 10 October 2005 outlining their concerns with respect to the matters of NES.

DEH stated that provided impacts on Brigalow and Bluegrass resulted in less than an additional 20 ha to be cleared (above the original EPBC referral of 6 ha for Brigalow and 0 ha for Bluegrass) then the project will not have a significant impact on these communities. Section 4.4.1 indicates that the project will meet these requirements (additional of approximately 19 ha of Brigalow and approximately 17 ha of Bluegrass to be cleared).

DEH also required that additional studies be undertaken for Ornamental Snake habitat and an assessment made with respect to the risk to this species as a result of the project. These additional studies have been undertaken as part of this EIS process and the results indicated that the project will not have a significant impact on this species (refer to Section 4.4.2.1). The results of these studies have been provided to DEH.

1.6.1.2 Queensland Government Approvals

State Development and Public Works Organisation Act 1971

The SDPWO Act 1971 establishes an environmental assessment process for projects declared to be 'significant projects.' This process can replace referral and assessment stages of the Integrated Development Assessment System under the *Integrated Planning Act* 1997. Under the a bilateral agreement with the Commonwealth government, the significant project EIS process can be accredited as an acceptable form of assessment for the decision making under the EPBC Act 1999.

On 12 August 2005 the project was declared a 'significant project' pursuant to section 26 of the SDPWO Act 1971. The EIS for the project will comply with all EIS requirements specified in the SDPWO Act and the final Terms of Reference (ToR) (refer to Appendix A).

Integrated Planning Act 1997

The *Integrated Planning Act 1997* (IPA) establishes the Integrated Development Assessment System (IDAS), which integrates a range of development approvals.

Under *Chapter 2, Part 6* of IPA a Minister or a local government may *Designate Land for Community Infrastructure*. Development under a *designation* is "exempt from assessment" against requirements of local government planning schemes. As such no approvals will be required from local government.

It is the intention of the Minister for Transport and Main Roads to *Designate Land for Community Infrastructure* for this project.

Under *Schedule 8* of IPA several specific environmental approvals are triggered, they are listed in Table 2 and have been addressed under the relevant governing legislation (eg *Environmental Protection Act* 1994) below.

Under Schedule 9, Table 4 – Item 1 of IPA, Operational Work for the purposes of this project is "exempt from assessment" against requirements of local government planning schemes.

The construction camps (refer to Section 3.6.2) required to accommodate the construction workforce will not be included under the designation and therefore will not be exempt from the requirements of the local government planning schemes. Accordingly, a Development Approval (DA) will be required for these camps under IPA provisions from the relevant local government. Similarly, IPA development approvals

may be required for any borrow-pits required to construct the rail link. As the location of these borrow pits are not known at this stage they cannot be included in the designation, however all borrow pits will be located in close proximity to the line.

It should be noted that all project impacts have been addressed in this EIS, whether or not they require specific approvals. Exemptions from approvals do not preclude addressing the impacts.

Table 2 Permits/Licenses and Approvals required for project

Permit, Approval or Licence	Why it applies	When it applies	Administrating Authority	Permit Application Details
Environmental Protection and Biodiversity Conservation Act 1999	Activities significantly affecting matters of National Environmental Significance.	Planning Phase	Department of Environment and Heritage	Commonwealth Referral
Integrated Planning Act 1997	Construction camps, borrow pits/quarries	Construction Phase	Local Government/s	Development Approval
Vegetation Management Act 1999	Clearing of mapped regional ecosystems	Construction Phase	Dept Natural Resources and Mines	On-going clearing approval from Dept NRM
Water Act 2000	Destroying vegetation, place fill or excavating in a water course	Construction Phase	Dept Natural Resources and Mines	Approval/licence from Dept NRM Section 286 (Riverine Protection Permit)
Water Act 2000	Dredging within water courses	Construction Phase	Dept Natural Resources and Mines	Section 280 – taking, getting, removing or otherwise interfering with quarry material in or from a watercourse or lake.
Nature Conservation Act 1994	Destroying a vulnerable flora species	Construction Phase	Environmental Protection Agency	Approval from EPA
ERA 15 (Sewage treatment)	Operation of work force construction camp for during construction phase	Construction Phase	Environmental Protection Agency	Licence from EPA

Permit, Approval or Licence	Why it applies	When it applies	Administrating Authority	Permit Application Details
ERA 20 – Extractive activities	Required if new quarries or borrow pits are required to extract > 5000 tonnes of material. Please note that this is on an individual basis and not cumulative.	Construction Phase	Environmental Protection Agency	Licence from EPA
ERA 60 – Cement manufacturing	Required if greater than 100 tonnes of concrete is required to be manufactured on site.	Construction Phase	Environmental Protection Agency	Licence from EPA

Environmental Protection Act 1994

To prevent environmental harm, the General Environmental Duty established under Section 36 of the Act must be observed and activities must be undertaken with due diligence. The General Environmental Duty states "a person must not carry out any activity that causes or is likely to cause environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm". To act with due diligence, the parties must show that the environmental risk associated with the activity has been assessed and minimised where possible.

This Act outlines Environmentally Relevant Activities (ERAs) that require licensing from the Environmental Protection Agency (EPA). Table 3 outlines the ERAs that may be relevant to this project.

Table 3 Environmentally Relevant Activities relevant to this Project

ERA	Comments
ERA 15 – Sewage treatment works	This will be dependent on whether a construction camp is required for the project or whether the construction work force will make use of existing accommodation facilities at Collinsville, Glenden or Moranbah. Should construction camps be built then an approval is required. This will be determined closer to construction.
ERA 20 – Extractive activities (ballast supply, gravel, fill material)	It is presumed that gravel and any fill materials (such as ballast supply) will be sourced from existing quarries that are licensed under the *Environmental Protection Act 1994*. However, should new quarries or borrow pits be required and > 5000 tonnes will be extracted from each one, then this will be an ERA and licenses will need to be obtained (only where > 5000 tonnes are to be removed).
ERA 60 – Cement manufacturing	It presumed that the concrete rail sleepers will be made at a licensed premises, however should concrete batching of >100 tonnes be required on site then this will be an ERA and a license will need to be obtained.

Subordinate legislation developed under the *Environmental Protection Act 1994* includes the following:

- *Environmental Protection Regulation 1998* which details activities which require approval for being carried out, environmental nuisance, ozone depleting substances, national pollutant inventory, used packaging materials, quality standards for petrol and diesel, administration, provisions and prescribed periods.
- *Environmental Protection (Water) Policy 1997* which states legally binding standards for water quality.
- *Environmental Protection (Noise) Policy 1997* which states legally binding standards for noise nuisance.
- *Environmental Protection (Air) Policy 1997* which states legally binding standards for air quality.
- *Environmental Protection (Waste Management) Policy 2000* which sets out waste management requirements for local and state governments.
- *Environmental Protection (Waste Management) Regulation 2000* which sets out requirements for waste disposal and receival, waste tracking and management of special wastes.

Transport Infrastructure Act 1994

This Act relates to the general obligations of the State for government supported transport infrastructure. Section 10 of the Act notes that the State has a wide ranging responsibility to take into account national and international benchmarks, and international best practice while constructing, maintaining and operating infrastructure. The State is also to consider the safety of the infrastructure and the transport that operates on it.

Vegetation Management Act 1999

The *Vegetation Management Act 1999* and associated *Vegetation Management Regulation 2000* addresses the conservation and management of vegetation communities. Specifically it provides protection for mapped regional ecosystems classified as "endangered", "of concern" or "not of concern" under the Act. The Department of Natural Resources and Mines (DNRM) administers the Act. Broadscale clearing of remnant vegetation in Queensland will be phased out by December 2006. Applications to clear vegetation may now only be made for ongoing clearing purposes.

Applications for ongoing clearing purposes can be made at any time, if the chief executive is satisfied that the clearing is for one of the following purposes:

- a project declared to be a significant project under the *State Development and Public Works Organisation Act 1971*, Section 26;
- necessary to control non-native plants or declared pests;
- to ensure public safety;
- for establishing a necessary fence, firebreak, road or other built infrastructure, if there is no suitable alternative site for the fence, firebreak, road or infrastructure;
- a natural and ordinary consequence of other assessable development for which a development approval as defined under the *Integrated Planning Act 1997* was given, or a development application as defined under the *Integrated Planning Act 1997* was made, before 16 May 2003;
- for fodder harvesting;
- for thinning;
- for clearing of encroachment;
- for an extractive industry;
- for clearing regrowth on leases issued under the *Land Act* 1994 for agriculture; or
- or grazing purposes.

The project will require a clearing permit for On-going Clearing Purposes to remove the mapped regional ecosystems found along the proposed alignment. All applications to clear must be accompanied by a Property Vegetation Management Plan (PVMP).

Nature Conservation Act 1992

The *Nature Conservation Act* 1992 and Regulations is the principle Act in Queensland addressing nature conservation. The *Nature Conservation (Wildlife) Regulation* 1994 prescribes protected species of wildlife as presumed extinct, endangered, vulnerable, rare or common. The Act is administered by the Queensland EPA who is responsible for the conservation of all protected wildlife in Queensland. QR

must ensure that it is aware of any protected species inhabiting the project area because it is an offence to interfere with protected flora and fauna without the approval of the EPA.

A permit from the EPA will be required to destroy the vulnerable *Dichanthium queenslandicum* (King Bluegrass) that has been recorded along the rail corridor.

Water Act 2000

This Act has been developed to fulfil Queensland's responsibilities under the 1994 Water Resources Policy of the Council of Australian Government (COAG). It aims to address legislative requirements for the majority of Queensland's non-tidal waters. The Act basically sets out the law, with respect to rights to surface and groundwater, the control of works with respect to surface and groundwater conservation and protection, irrigation, water supply, drainage and flood control. The Act may require QR to obtain the relevant approval/licence for any works which may affect surface and groundwater. The following permits may be required:

» Section 237 – taking water from watercourse, lake, spring or underground water source;

» Section 286 – destroy vegetation, place fill or excavate in a watercourse(Riverine Protection Permit); and

» Section 280 – taking, getting, removing or otherwise interfering with quarry material in or from a watercourse or lake.

Note that even though the *Transport Infrastructure Act* 1994 provides for the Chief Executive Officer to divert a watercourse or construct a water course (temporary or permanent) during road works, the above permits must still be obtained from DNRM.

Land Protection (Pest and Stock Route Management) Act 2002

The *Land Protection (Pest and Stock Route Management) Act* 2002 provides a framework and powers for improved management of weeds, pest animals and the stock route network.

Weeds and pest animals cause degradation of natural resources, threaten conservation of biodiversity, threaten remnant vegetation, reduce rural production and interfere with human health and recreational activities.

There are three classes of declared plants under the *Land Protection (Pest and Stock Route Management) Act* 2002. These plants are targeted for control because they have, or could have, serious economic, environmental or social impacts. Declaration under state legislation imposes various legal responsibilities for control by landowners on land under their management, including all landowning state agencies.

1.6.2 Permits, Approvals and Licences

Based on the information provided by QR regarding the proposed works, Table 2 summarises the relevant permits, approval and licences as they apply to the project.

It is presumed that gravel, ballast and any fill material will be sourced from existing quarries that are licensed under the *Environmental Protection Act 1994* and have local government planning approval. Should these materials need to be sourced from new location, then approvals may be required from the EPA. In addition, should sourcing ballast from existing quarries result in an increase in throughput above

approved thresholds, then approvals may be required under IPA and/or EPA. Similarly, it presumed that all concrete infrastructure will be manufactured at a licensed premises.

New construction camps may need approvals for sewage treatment facilities.

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2. Project Substantiation

This section of the EIS provides details that justify the need for the project with particular reference to the environmental, economic and social costs and benefits. Several alternatives to the project have also been considered and are discussed in order to demonstrate that the proposal is the preferable alternative.

2.1 Need for the Project

QR is a significant contributor to the local, regional and national economy, with over 144 Mt of coal transported from over 30 coalmines via 5 existing rail corridors in Queensland – Newlands, Goonyella, Blackwater, Moura and West Moreton – to six coal export terminals and domestic coal users. For coal haulage operations in Queensland, the interconnected system includes the following five rail systems (from north to south):

- The Newlands rail system. This is a non-electrified line connecting coalmines in the northern Bowen Basin to Abbot Point coal terminal. Trains operating on this system haul approximately 4700 tonnes of coal.
- The Goonyella rail system. This is an electrified line connecting coal mines in the central Bowen Basin (e.g. from Gregory Mine in the south to North Goonyella Mine in the north and Blair Athol Mine in the west) to the Dalrymple Bay and Hay Point coal export terminals. Trains operating on this system haul approximately 9970 tonnes of coal.
- The Blackwater rail system. This is an electrified line connecting coalmines in the southern Bowen Basin, from the Gregory mine in the north and Blackwater mine in the south, to the RG Tanna and Barney Point coal export terminals at Gladstone, and to domestic coal users in the Rockhampton area. Trains operating on this system haul approximately 7200 tonnes of coal.
- The Moura rail system. This is a non-electrified line connecting the Moura, Callide and Boundary Hill mines to the RG Tanna and Barney Point coal export terminals at Gladstone. It also links the three mines with the Gladstone power station and other domestic users in the Gladstone area. Trains operating on this system haul approximately 4200 tonnes of coal.
- The Surat/West Moreton rail system. This is a non-electrified line connecting coalmines in the eastern Surat Basin and the Moreton Basin, west of Brisbane, to both the Fisherman Islands coal export terminal at the port of Brisbane and the Swanbank power station. Trains operating on this system haul approximately 1900 tonnes of coal.

The current strong global demand for Australian coals is opening up expansion opportunities for many Queensland coalmines. With this growth in the coal sector, there is a need to increase rail infrastructure to enable coal to be transported effectively. QR is now targeting a haulage task of more than 194 Mtpa within five years in Queensland alone (Smith *et al* 2004). A corresponding increase in coal port export capacity will also be required to accommodate this growth. The NML solution between the Goonyella and Newlands systems has been identified as a critical path to facilitate the export of thermal and coking coal, and to allow the Queensland Government to continue its commitment in developing rail and port capacity ahead of increasing demand for domestic and export coal.

There are many benefits that would emerge from the completion of the NML. These benefits would accrue to different sectors of the Queensland economy and include:

» System-wide – the construction of the NML will enable deferral of expensive infrastructure augmentations elsewhere;

» Marketing - the development of the NML may provide additional assurance to coal buyers;

» Insurance – the construction of the NML will potentially enable the most valuable tonnes of coal to be shipped through Queensland coal export terminals in the event of an interruption to the coal chain elsewhere;

» Relieving capacity constraints – ensuring that there is sufficient coal chain capacity will enable optimal rail efficiency;

» Strategic – mines, their customers (and the government) may perceive benefits in having a greater choice in export terminal; and.

» If electrified, the NML will improve the deployment and operational flexibility of both electric and diesel motive power into the medium to long-term.

The NML will provide additional options for the mines to market and export coal. Similar options are available for the Newlands Mine if required. The link will also provide the opportunity for smaller coal deposits in the south Newlands area to be developed at a more reasonable cost.

Apart from the direct benefits to the mines, there will be significant benefits to the Bowen area. Additional direct employment will be generated at Abbot Point Coal Terminal to support the maintenance of the railway and rolling stock maintenance activities. This in turn will generate indirect employment in the Bowen area.

In summary the benefits of the project are:

Increased Rail and Port Capacity

Coal exports are currently restricted by the existing rail infrastructure and its capacity. The construction of the Newlands to North Goonyella rail line will link two existing corridors. This will allow port capacity expansion at Abbot Point. It will allow coal trains presently operating on the Goonyella system and using Hay Point, to unload at Abbot Point when required. Likewise, trains unloading at Abbot Point can alternatively use the Hay Point Port facilities.

Lower Total Coal Chain Cost

The economic cost to the coal industry from the NML and Abbott Point expansion is estimated to be comparable to the alternative expansions in the Goonyella or Blackwater systems and at Hay Point.

Strategic Emergency Link

It is envisaged that the project will provide a strategic emergency link should the Goonyella line be closed or in the event of port closures.

2.2 Relationship to Other Projects

The NML project is closely related to the Stages 2 and 3 Expansions of the Abbot Point Coal Terminal.

The Ports Corporation of Queensland (PCQ) is the owner of the Abbot Point Coal Terminal, located at Abbot Point to the north of Bowen on the Central Queensland coast. PCQ are proposing to carry out

Stages 2 and 3 Expansions of the terminal in order to increase the handling capacity of the port to around 50 million tonnes per annum (Mtpa).

The demand for export coal from Queensland coalfields has increased significantly in recent years. Abbot Point currently receives coal from local coalmines along the Newlands rail system (Newlands and Collinsville mines) and the Stage 2 Expansion of Abbot Point, due for completion in 2007 will provide the capacity needed to support these mines and accommodate volumes from the Goonyella system (21 Mtpa). With the potential construction of the NML project, coal from mines in the Bowen Basin (other than the Newlands and Collinsville mines) can be exported. The Stage 3 Expansion of Abbot Point would increase the handling capacity of the port to around 50 Mtpa. It is expected that the expansion of Abbott Point would not proceed if the NML infrastructure project does not proceed.

The EIS for Stages 2 and 3 Expansions of the Abbot Point Coal Terminal is being prepared concurrently with the NML EIS.

The construction of the NML project is dependent on the approval and construction of the Stages 2 and 3 Expansions of Abbot Point Coal Terminal.

Other related projects include departure path dredging for the Port of Hay Point which will increase ship turn around time and result in increased port capacity and coal sales.

2.3 Alternatives

2.3.1 Background

2.3.1.1 Previous Studies

The need to link the Goonyella rail system with the Newlands rail system was first identified in 1992 and QR undertook a detailed rail corridor study (Queensland Rail 1992). This link was identified as being strategically important to allow a choice of port facilities for mines in the central and northern Bowen Basin as Hay Point was nearing maximum capacity, and the link would also foster new mines within the region.

This corridor study included a constraints analysis and consultation with potentially affected landowners and stakeholders. Based on this study three possible corridors, which were generally supported by all stakeholders, were identified and costed. The location of these corridors is provided in Appendix C.

In the year 2000, a review examined the commercial feasibility of constructing the North Goonyella to Newlands “Missing Link” and concluded that construction of the rail link was not a commercially viable option at that time.

2.3.1.2 Current Project

With the current growth in the coal industry and the requirement for QR to increase rail infrastructure, the need to link the Goonyella and Newlands systems was reconsidered. As part of the pre-feasibility study, two major alternate routes were considered, one via North Goonyella (using the corridors identified in the 1992 study) and one via Hail Creek. These alternatives are discussed below and a comparison provided to demonstrate that the NML proposal is the preferable alternative. Both alternatives connect to the Newlands system in similar locations. In addition, a ‘Do Nothing’ alternative has also been assessed.

2.3.2 Alternative of Taking No Action

Should the NML project not proceed, there will be no change to the current operations in the Newlands and Goonyella rail corridors and to the transportation of coal in the Bowen Basin. This alternative would continue to allow the under-utilisation of the port of Abbot Point as a result of insufficient coal in the Newlands system, and to continue to upgrade the coal ports at Dalrymple Bay and Hay Point which are experiencing difficulty in meeting existing and future coal demands. This alternative would also restrict the economic feasibility of opening up new mines in the region.

The alternative of not undertaking the project would see the State of Queensland and national economy forego the following opportunities:

- Potential for most cost efficient increased coal sales;
- Increased coal haulage to the port of Abbot Point, which is currently being upgraded to accommodate additional coal;
- Potential for increased employment within the Bowen region, as a result of the expansion of the Abbott Point coal terminal and increased coal haulage;
- Ability to have alternative coal haulage routes should either the Newlands or Goonyella rail lines go off-line;
- Ability for new mines to be developed in the region at lowest economic cost and subsequent increase in employment at these mines; and
- Ability to have an inland rail corridor during times of emergency, such as flooding of the coastline.

2.3.3 Hail Creek to Newlands Alternatives

These railway route alternatives are shown in Appendix C.

2.3.3.1 Hail Creek to Newlands: Option A

This option departed the Hail Creek Branch (which lies approximately 50 km to the east of North Goonyella) at the 42.5 km mark, and extends in a north-west direction, following the creek valleys through the Denham Range in the south. The proposed corridor then runs parallel to the western side of the Redcliffe tableland in the north, before connecting to the Newlands line.

As this option involved a number of creek crossings, it had substantial environmental implications and would have required a number of sensitive crossings.

2.3.3.2 Hail Creek to Newlands: Option B

This option follows the same route as option A up to the 25 km mark on Denham range. However, from this point Option B heads northwest for approximately 40 km. The final 12 km runs in a northerly direction, joining the Newlands Branch at the 14 km mark. The length of this route is approximately 75 km.

Both of these options (A and B) were considered not preferable due to of the difficulty in interfering with existing mining leases and the larger number of landowner along the alignments. Maunsell (2005a) recommended that the Goonyella to Newlands option be the preferred option.

2.3.4 Northern Missing Link (Goonyella to Newlands) Alternatives

Connecting the rail lines between North Goonyella and Newlands has been the preferred alignment since 1992. Corridor studies undertaken by QR in 1992 identified three potential alignments based on constraints and consultation with stakeholders. These alignments have been incorporated into the current study as three alternatives (Northern, Central and Southern) to the original, or preferred alignment. The original alignment and these various alternatives are provided in Figure 2-1 and are discussed below.

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Figure 2-1 Northern Missing Link Alternatives

2.3.4.1 Northern alternative

The northern alternative applies to the northern 20 km section of the link. The main driver for this alternative is to reduce the impact of severance to affected properties. It is located 6 km east of the preferred alignment. A detailed assessment of this alignment was undertaken (Maunsell 2005b) and this study indicated that the alignment would impact on significant environmental features, including the EPBC listed ecological community: Brigalow (*Acacia harpophylla* dominant and co-dominant).

The alignment was eventually dismissed due to environmental, cultural heritage and engineering reasons (Maunsell 2005b).

2.3.4.2 Central alternative

The central alternative applies to 10 km of track immediately north of the Suttor Creek crossing and is located approximately 2.5 km west of the original alignment. The alternative was required to avoid a coal seam that the preferred alignment dissected. Subsequent to this mining lease being developed, the central alternative has been adopted as the preferred alignment (Maunsell 2005c).

2.3.4.3 Southern alternative

The southern alternative consists of the southern 17 km section of the NML, and is located approximately 5 km west of the original alignment. The southern alternative avoids the coal seams in the region, as well as a proposed mining lease held by BMA[1] (Wards Well Mine). During the EIS process, BMA provided confirmation that they will develop the Wards Well Mine, effectively nullifying the original alignment, and making the southern alternative the preferred alignment (Maunsell June 2005d). However the affected landowner raised a number of concerns with respect to this southern alignment and subsequently a number of other 'hybrid' alignments (Options A, B, C and D) have been developed. These hybrid alignments are outlined below and illustrated in Figure 2-2.

[1] BHP MITSUI Coal Pty Ltd

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Figure 2-2 Alignment Options (A-D) for the Southern alternative to the Northern Missing Link

Option A

Follows the original alignment. As outlined above, this option has been disregarded, as it will be affected by the BMA mining lease and proposed mining infrastructure.

Option B

This is the current southern alternative alignment and also the preferred alignment, as it avoids the coal seams in the region, as well as the proposed BMA Wards Well Mine and associated infrastructure. This option passes approximately 1800 m to the west of the affected homestead (Denham Park). Discussions with the affected landowner (refer to Section 4.6) indicate that this option will disrupt cattle movement across the property. In addition, the landowner would prefer for the alignment to pass to the east of his homestead (refer to Figure 2-2 and Figure 4-4). Mitigation measures have been provided to minimise the impact on property management.

A detailed noise assessment has been undertaken for the project and the results are provided in Section 4.8. This assessment shows that the noise from the rail corridor during operation will not exceed EPA guidelines at the homestead for this option.

Option B crosses through a largely cleared landscape however will result in the clearing of a small area (5.26 ha) of isolated patches of endangered regional ecosystems (11.4.9 and 11.3.1), and EPBC listed threatened ecological communities (Brigalow) and cause fragmentation to the habitat of the EPBC listed Ornamental Snake (refer to Sections 4.4.1 and 4.4.2 for more details). Mitigation measures have been provided in the EMP to minimise the impacts to the Ornamental Snake habitat, including the use of box culverts to allow snakes to move beneath the rail corridor.

This option passes to the west of the homestead and will not cross the main access road for the property.

Option C

Figure 2-2 shows that this option is aligned approximately 700 m to the west of Option A (original alternative), but swings west to avoid the BMA Mining lease (following the southern boundary of the proposed mining lease) before joining with option B (southern alternative). This alignment crosses to the east of the homestead, however as the corridor follows the southern boundary of the proposed mining lease it will pass within approximately 918 m of the homestead, potentially resulting in increased noise and air quality impacts during construction and operation. This option will also impact on vegetation and cultural heritage issues as discussed below.

A detailed noise assessment has been undertaken for the project and the results are provided in Section 4.8. This assessment shows that the noise from the rail corridor during operation will not exceed EPA guidelines for this option.

An assessment of air quality related impacts is provided in Section 4.7.2. This section discusses impacts specific to this homestead (Denham Park) including dust and exhaust emissions generated during construction, and coal dust emissions during operation phases of the project. Denham Park homestead is almost completely surrounded by eucalypt woodlands and this vegetation would provide some buffer from dust generation during construction and coal dust during operation.

Option C will require the clearing of a very small area of endangered regional ecosystems (0.68 ha), and cause some fragmentation of Ornamental Snake habitat. However this option will require the clearing of 14.81 ha of Not of Concern regional ecosystems (11.5.3 and 11.5.1), and will result in the fragmentation

of these large intact vegetation communities (refer to Sections 4.4.1 and 0 for more details). These communities are likely to be providing habitat for native wildlife.

A cultural heritage survey was undertaken along the option to determine presence of aboriginal cultural heritage. This survey identified 24 cultural heritage artefacts/sites along or adjacent to this option, including isolated finds, artefact scatters and a hearth (fireplace). Further information is provided in Section 4.5.1.

This option passes to the east of the homestead and will cross the main access road into the property.

Option D

This option is similar to Option C in that it follows the southern boundary of the BMA Mining lease, however it branches off from the existing rail corridor at the end of the existing balloon loop. This option has been rejected due to considerable cost and logistics involved in constructing the additional infrastructure required to allow trains to access this option from the balloon loop.

This option has similar impacts on the environment as Option C as it follows essentially a similar route, especially in the northern section past the Denham Park homestead. The impacts with respect to noise, air, regional ecosystems, ornamental snake habitat and cultural heritage for Option C can be applied to this option.

Comparison of Options in Southern Alternative

Based on the above descriptions, Options A and D have been disregarded based on engineering and feasibility grounds. As such a comparison of the environmental features of Options B and C is provided in Table 4.

Table 4 Comparisons of environmental features for Options B and C (Southern Alternative)

Environmental Feature	Importance to Project	Option B	Option C
Noise	Low	» Noise associated with construction activities should be less due to greater distance to the rail corridor (> 1.5 km). » Noise from the rail corridor during operation will not exceed EPA guidelines for this option.	» Noise associated with construction activities will be more noticeable due to proximity of the rail corridor (~ 900 m). » Noise from the rail corridor during operation will not exceed EPA guidelines for this option.
Air	Low	Impacts to air quality associated with construction activities (dust, exhaust emission) and coal dust from operation activities should be less due to greater distance to the rail corridor (> 1.5 km).	Impacts to air quality associated with construction activities (dust, exhaust emission) are likely to be greater due to proximity of rail line (~900 m), however, Denham Park homestead is almost completely surrounded by eucalypt woodlands and this vegetation would provide some buffer from dust during construction and coal dust during

Environmental Feature	Importance to Project	Option B	Option C
			operation.
Flora/Vegetation	High	This option will impact on 5.26 ha of Endangered regional ecosystems and EPBC listed threatened ecological communities (Brigalow).	This option will impact on 0.60 ha of Endangered regional ecosystems and 14.81 ha of Not of Concern regional ecosystems.
Fauna/Habitat	High	Impacts include: » loss of 37.09 ha of Ornamental Snake habitat; and » fragmentation of Ornamental Snake habitat.	This option will result in loss of 27.80 ha of Ornamental Snake habitat. This option will fragment a large intact area of remnant eucalypt vegetation that is likely to be providing habitat to native wildlife.
Cultural Heritage	Moderate	One cultural heritage artefact (scatter) located along rail corridor.	Twenty-four cultural heritage artefacts located within the rail corridor, including isolated finds, artefact scatters and hearth (fireplace).
Social (Cattle Management)	High	This option follows an existing fence line to the west of the homestead. There will be some disruptions: » fragmentation of the southern end of one paddock (Turkey Brush Paddock) and requirement for new watering point; and » fragmentation to the holding yard to the west of the homestead and cattle movement along the laneway from the holding yard.	This option passes through the centre of two existing paddocks and will cause the following disruptions: » fragmentation of two large paddocks (Turkey Bush Paddock and Back Paddock); » loss of watering points in both these paddocks and requirement for new watering points; and » problems with the mustering of cattle to existing holding yards and laneways from affected paddocks, with possible requirement for a new laneway.
Road crossings	Moderate	Minimal interaction required with the railway, as most vehicle/stock movements will go under a railway bridge west of the homestead. This option will not impact on the main access road into the	An occupational level crossing is required for the main access road into the property and homestead. This poses a potential safety issue.

Environmental Feature	Importance to Project	Option B	Option C
		property.	
Construction Costs	High	$55 M	$60 M
Rail Operations	High	This option requires 1.9 km less of rail line distance to maintain and for trains to travel.	1.9 km longer

From Table 4, it can be seen that Option C will result in greater impacts to cultural heritage values, fragmentation of eucalypt woodlands, is more expensive to construct and maintain and poses a safety concern with respect to crossing the main property access road. This option will also have a slightly greater impact on cattle management, as it will impact on two paddocks as opposed to only one in Option B. Option B will result in the loss of some endangered regional ecosystems, fragmentation of the EPBC listed Ornamental snake habitat, however mitigation measures have been included to minimise these impacts including the use of box culverts to allow snake passage under the rail line.

2.3.5 Preferred alignment

As part of the pre-feasibility stage of the project, Maunsell completed a comparison study of the two alternatives to connect the Goonyella and Newlands system (Maunsell 2005a). This study showed that the North Goonyella to Newlands alternative had a number of significant advantages over the Hail Creeks alternatives. These included lower construction value (of approximately $25 million), fewer environmental issues, fewer native title claimants, fewer property owners and a much more developed alignment and clearer resolution of requirements of property owners.

The preferred NML alignment is a combination of the original alignment and the central and southern alternatives. The northern alternative was rejected due to substantial impacts to EPBC listed Brigalow communities. The central alternative was chosen to avoid the existing coal seam that the original alignment dissected. As discussed above, the southern alternative was chosen as this avoids the proposed Wards Well mining lease. A number of hybrid options have been developed for this alternative and Option B is preferred as this will avoid cultural heritage issues, has less of a safety risk and less expensive to construct and maintain (Maunsell June 2005d).

The preferred alignment is illustrated in Figure 2-3.

Figure 2-3 Preferred Alignment

3. Description of the Project

The purpose of this section of the EIS is to provide a description of the Project through its lifetime of planning, construction and operation.

At the time of producing the EIS, the project was in the preliminary design phase and detailed information on the different aspects of the construction and operation requirements were not available. Where possible, provisions have been made in the Environmental Management Plan (EMP) to ensure that environmental issues are considered during detailed design.

3.1 Location and General Description

3.1.1 Location

The project area is located within the North Bowen Basin, an important coal-mining region of Central Queensland. Numerous coalmines are situated within the region with many new mines proposed.

The project area for the project includes the beef grazing country between North Goonyella and Newlands coalmine. The rail corridor commences on relatively flat lowlands, branching off from the existing rail line at North Goonyella and generally heads north for approximately 40 km through mainly undulating grazing pastures, remnant vegetation and crosses several small ephemeral[2] creeks and drainage lines. From here, the route crosses through the basalt ridges and plugs of the Leichhardt Range before descending over native grasslands before joining with the existing rail line to Newlands mine. The project area is shown in Figure 1-2.

The nearest towns to the project area are Moranbah and Glenden. Moranbah lies 40 km to the south east of Goonyella and services the mines in the region, including Goonyella, Broadmeadows and Riverside coalmines. Glenden is situated approximately 40 km south-east of Newlands and services local coalmines including the Newlands mine. Other important regional towns include Nebo approximately 77 km east of North Goonyella, and Collinsville, approximately 66 km north of Newlands.

3.1.2 Project Description

The track configuration for the NML is essentially single 60 kg rail, 26.5 TAL[3] concrete sleepers, with a design speed of 80 km/hr and three passing loops located at approximately 20-25 km spacing[4]. The approximant locations of the loops are: North Goonyella; Midway and Newlands. The loops are each approximately 2.35 km in length to permit passing of Goonyella-length trains. Turnouts on the loops are to be 1 in 16, which permit 50 km/hr speeds for trains entering or exiting the loops.

[2] A waterway which flows only after a rainfall event and has no base flow component

[3] Tonnes Axle Load

[4] Determined with operational modeling by QR Network Access

3.1.2.1 Design Criteria

A comprehensive set of design criteria has been developed specifically for this project and provided in Appendix D. These design criteria were developed based on QR design requirements and experiences gained from similar projects. Some of the major design criteria are indicated below:

Description	**Criteria**
Design Life	50 years
Design Speed	80 km/hr
Track standard	60 kg rail on concrete sleepers to withstand 26.5 TAL
Tonnages to be transported	Stage 1A: 25 MTPA Stage 1B: 30 MTPA Stage 2: 41 MTPA Stage 3: 50 MTPA
Likely Train Consists	**Diesel:** 3 x 2250 + 75 x 78T wagons or equivalent (Stages 1A & 1B) 4 x 4000 + 116 x 106T wagons or equivalent (Stages 1A & 1B) 4 x 4000 + 120 x 106T wagons or equivalent (Stages 2 & 3) **Electric**: 3 x 3700 + 120 x 106T wagons or equivalent (Stages 2 & 3)
Passing Loop	Three loops with 2150 m between Clearance Points
Flood immunity	Q100 for bridges and Q50 for culverts
Maximum grades	1:105
Rail bridge design loading	300-A-12
Signalling	RCS

A four-meter wide at formation level maintenance access track will be constructed along the entire length of the corridor. Preliminary horizontal and vertical design drawings for the corridor are provided in Appendix E.

3.1.2.2 Location of construction works

Locations of construction camps, site offices, storage areas and compounds have not been finalised, however these are to be located near public access road, within existing cleared areas, away from affected homesteads and where possible, cattle yards.

3.1.2.3 Access Roads

Prior to construction, access roads are to be designated, identified and used throughout the project. No new access requirements are envisaged to be required for this project. Existing access at Suttor Developmental Road and the new Cerito-Elphinstone Road will serve as the major access roads. Initially, however, some additional access paths may need to be negotiated with landowners to obtain

access into sites if the construction contractor requires them. Where private farm roads are to be used, these will be negotiated with the landowner and be restricted to the main property road and major secondary roads.

3.2 Construction

3.2.1.1 Staging options

The main objective of the Northern Missing Link Project is to deliver sufficient rail infrastructure to enable the haulage of up to 50 Mtpa of coal from the existing Newlands and Goonyella rail systems to Abbot Point Coal Terminal using Goonyella style trains (i.e. trains that have a maximum length of 2 kilometres; maximum axle load of 26.5 tonnes and are electric locomotive hauled). The scope of this EIS only includes the construction and operation of the rail link section.

In order to achieve this objective and to help manage the risk exposure while ensuring that the capacity of the system "matches" the demand it is proposed to stage the works in three stages with Step 1 having two sub-stages. These are summarized below:

Table 5 Project Staging

Stage	Objective to be achieved
1A	Physical construction of the Goonyella and Newland rail link
	Provision of train turning infrastructure in the Goonyella system for those mines that need to access Abbot Point Coal Terminal
	Upgrading of the existing Newlands system to accommodate 26.5 tonne axle load traffic (utilising DEL train operations)
	Capacity for NML and Newlands system of 25 Mtpa
1B	Lengthen all loops on the Newlands System to accommodate Goonyella length trains
	Provision of additional train turning infrastructure on the Goonyella system for the additional mines wanting to access Abbot Point Coal Terminal
	Capacity expansion for NML and Newlands system to a minimum 30 Mtpa
2	Upgrade the Newlands system to allow Goonyella system trains to access Abbot Point Coal Terminal by:
	Construction of a rail deviation around the steep grade of the Briaba Bank
	Electrification of the Newlands system (timing to suit availability of electric locomotives and tonnage profile)
3	Capacity expansion of the Newlands and Goonyella systems to accommodate 50 Mtpa at the Abbot Point Coal Terminal

The construction of the NML and two of the proposed passing loops is to occur during Stage 1A. Electrification of the NML is to occur in Stage 2 and the construction of the third passing loop in Stage 3.

3.2.1.2 Construction methodology

Consideration has been given for the construction methodology to enable pricing and programme issues to be addressed together with adequate risk management considerations. More detailed investigations are planned to be undertaken early to mid 2006 to suit the program for delivery of the proposed works with due regard to pre-contract advanced works.

For the purposes of this EIS, it has been assumed that construction of the civil works for the NML will be undertaken from north to south, with progressive handover to enable track construction to follow closely behind. The earthworks and quantities for the project have been designed to cater for future 25kV electrification of the rail line. The cross section also has been designed to provide a full-length maintenance access track, four meter wide at formation level, on the side of the electrification mast. At passing loop locations, an access track has been provided on the side of loop track. The final design, location and standard of the maintenance access track will be determined as part of the detailed design phase.

A corridor width of 60 m has been nominated, which is considered sufficient for full or partial duplication if required at a future stage. At the detailed design stage, the precise rail corridor will be defined using chords and could be reduced in areas of flat terrain. The corridor width will exceed 60 m where deep cuts or high embankments are required (Maunsell 2005e).

3.2.1.3 Construction equipment, materials and logistics

The following construction equipment are likely to be required for the project:

- Tip and dump trucks;
- Rollers;
- Dozers;
- Scrapers;
- Excavators;
- Paving machines (for processed capping layer);
- Graders;
- Cranes;
- Backhoes;
- Pile rigs;
- Water carts;
- Fuel trucks; and
- 4WD vehicles.

It should be noted that these are estimates only and the actual type and number of vehicles is to be determined by the construction contractor.

The earthworks will be undertaken using scrapers for the short hauls, with excavators and dump trucks used for long distance earthmoving. It is intended that the majority of the general fill will be obtained from the cutting excavations. The alignment has been graded to produce a balanced cut to fill. The grading could be optimised during detail design to account for likely quantities of unsuitable material obtained from detailed geotechnical investigations. Table 6 provides an estimation of the volumes of the major materials required for the project. As the project is still within the preliminary design phase, detailed information is not available for the type of equipment, volume or source of construction material or storage locations. Investigations are currently being undertaken to determine potential sources of rock and gravel. Further information is provided in Section 3.3.

Table 6 Estimated volumes of major construction materials

Major Materials to be used for construction	Estimated Quantities*
Formation Works - Excavation	2,711,300 m^3
Formation Works – General Fill	2,391,800 m^3
Formation Works - Verge Materials	244,300 m^3
Formation Works - Top 600 Capping Layer	392,500 m^3
Ballast	195,250 m^3

* These quantities are indicative only based on preliminary design and are subject to variation pending completion of detailed engineering design.

Construction equipment and materials to be sourced outside the project area will be transported via rail, road or a combination of both to the project area. Further information is provided in Section 4.10.1 and Table 35.

3.3 Ballast Supply and Logistics

Investigations are still being undertaken to determine sources for construction and ballast materials. Below is a summary of investigations to date.

A significant cost of the civil works is the large quantity of ballast material and capping material required for the project. Ballast is generally sourced from a commercial quarry, however several options exist for sourcing of the capping material. It is currently planned for capping material to be sourced from either cutting within the proposed rail corridor or borrow pit (to be established with appropriate approvals) that are located close to the rail corridor. Haulage would likely be across private land and along the rail corridor. Discussions with Bowen Shire Council and Queensland Department of Main Roads (DMR) - Northern Region, suggest that there are few operating quarries producing suitable materials in the vicinity of the NML. These are discussed below.

The BQC quarry at Euri Creek near Bowen (on the North Coast Line) produces a number of products, including railway ballast and road-base/capping layer material. Currently ballast material from this quarry is transported via road to Pring and then by rail from this point. Should Euri Creek be used for the NML project then any additional approvals beyond current permitted uses will be obtained at this time. However, it is likely that QR will seek public offers to supply the ballast with the object of sourcing it from a site closer to Newlands. All necessary approvals will be arranged at this time and obtained outside of the current EIS process.

Investigations of the basement rock in the environs of the alignment shows it is comprised of sandstone and siltstone materials, with minor volcanic rock. These materials may provide a ready resource of rock for processing of better quality materials for the project. Another main geological unit of the region is basalt flows, which located mainly to the east of the alignment. These materials may also provide a quarrying source depending on the depth of weathering and overburden materials.

More detailed investigations are currently be undertaken on sources of the ballast and construction material in the vicinity of the study area and to determine the preferred quarry(s) for the project and this information will be available at a later date.

Depending on the source, it is expected that ballast and construction material will be transported via a combination of rail and road to the project area. The preferred transport method would be via rail, as this would reduce the volume and load of heavy traffic on the local road network.

It is intended that the majority of the general fill for the project will be obtained from the cutting excavations. The alignment will be graded to produce a balanced cut to fill. The grading could be optimised during detail design to account for likely quantities of unsuitable material obtained from detailed geotechnical investigations.

3.4 Water Supply/Storage

There is limited information available on the source and supply of water for construction activities. It is the responsibility of the construction contractor to obtain a reliable water supply for the project.

3.4.1 Supply

The project area has limited water resources. Ground water sources tend to be limited and generally not suitable for drinking due to high saline and magnesium levels (refer to Section 4.3). There is limited ability to capture surface water flows, especially due to typically low rainfall within the area. Any surface water harvesting would need to ensure that it does not interfere with local catchments supplying private dams for cattle watering.

The Sunwater Burdekin to Moranbah water pipeline runs parallel to the alignment. This pipeline sources water from the Burdekin River and supplies it to Moranbah. The water is of drinking quality standard and would be suitable to use on the project. QR has commenced negotiations with Sunwater in gaining access to the water from this pipeline for the project. It will be the responsibility of the construction contractor to formalise any arrangements with Sunwater for water supply.

It is understood besides the Sunwater pipeline the remainder of the water for the project will be sourced from the bores sunk at 10 km intervals within the rail corridor. Any water be obtained from bores is to be tested to determine the quality of the water and possible usage (such as dust control). A permit will be required from DNRM to sink bores.

There will be no requirement to truck water to the construction site via the road network.

There is currently limited information on the volume of water required during construction activities. There will need to be sufficient water to be used for dust control, weed wash down bays, general construction activities, rehabilitation and for the construction camp.

3.4.2 Storage

Water is to be stored on site within purpose built tanks/dams. Turkey nests can be constructed to store groundwater and any recycled or reclaimed water. The location and future usage of these storage facilities is to be negotiated with the local council or landowner.

3.5 Stormwater Drainage

The rail corridor will intercept with a number of ephemeral creeks and drainage lines which generally flow from east to west. A preliminary assessment of the types of drainage structures required for the project to provide 1 in 50-year flood immunity to the top of rail formation has been completed as part of the preliminary design phase. Different sizes and numbers of culverts (CMP and RCBC)[5] will be used to accommodate the smaller drainage lines along the alignment. The major catchments of Kennedy Creek, Eaglefield Creek, Suttor Creek and a tributary to Suttor Creek will be bridged.

As the project is still within the preliminary design phase, detailed information is not available on stormwater drainage systems for construction and operation phases. Provisions have been provided in the EMP (Section 5.8.1.1) to address stormwater and sediment and erosion control and these are to be incorporated in the detailed design phase for the project.

3.6 Workforce and Accommodation

3.6.1 Workforce

There is limited information available on the skills or demographic status of the proposed construction workforce. This information will become more detailed during tendering stage and when the construction contractor has been commissioned. An average construction workforce of 200 people with a peak of 300 people will be required during the construction phase of the project. This number has been used to calculate information on waste generation during the construction phase.

It is acknowledged that there is a current skills shortage within communities surrounding the project area as a result of the mining industry. It is the responsibility of the construction contractor to ensure that suitably skilled personnel are employed for the project.

3.6.2 Accommodation

Accommodation for construction personnel will likely require construction camps due to the remoteness and length of the project area, together with the lack of available accommodation at Glenden and Moranbah (due to occupation by mining personnel). Given the length of the corridor it has been assumed that construction activities will require the establishment of two construction camps along the alignment. These camps could be subsequently used for construction personnel involved in trackwork, signalling and electrification.

3.6.2.1 Potential Locations

Definite locations for any construction camps have not been finalised, however a number of possible locations include:

- Sites in the north of the alignment either within private property (Suttor North Station) immediately adjacent to the existing sealed Newlands road near the intersection with Wollombi Road, or within Byerwen Station adjacent to the newly constructed Cerito-Elphinstone Road.
- Sites in the central corridor within private property (Lancewood Station or Bilyana Station) immediately adjacent the unsealed Suttor Developmental Road.

[5] CMP – Corrugated Metal Pipe; RCBC – Re-enforced Concrete Box Culvert

» A site in the southern alignment within private property (Denham Park) that can be accessed from the sealed North Goonyella private mine road.

Construction camps are to be located at least 1.5 km from private residences to minimise impacts from noise.

All of these options are located adjacent to existing roads and would allow personnel to easily travel to major regional centres on weekends and work leave (such as Bowen or Mackay).

Development approval under IPA 1997 will be required from the local authority to build the construction camp(s)[6]. Sufficient time will need to be provided within the project schedule to gain approval for a DA, and also any ERA licences from the EPA that may be required to construct sewage treatment facilities.

Some members of the work force (such as those with families) may need to be accommodated within local towns such as Collinsville and workers would commute along the sealed Cerito-Elphinstone Road to the project area. Collinsville has established service facilities, entertainment and community facilities to support such a workforce.

3.6.2.2 Camp Facilities

The construction camps will need to be largely self-sufficient with recreation facilities and supplies to ensure that construction personnel do not have to drive to local centres (Glenden, Moranbah or Collinsville). The construction camps are to be made from de-mountable single units built on concrete slabs or gravel.

The construction camps will also contain the following facilities:

» weed wash down bay;

» septic sewerage systems sufficient to accommodate the anticipated number of workforce personnel;

» dinning/cooking hall;

» laundry facilities;

» fuel, chemicals and waste storage;

» first aid station and designated vehicle;

» enclosed food storage (include cold storage), preparation and serving areas;

» vehicle and machinery parking areas;

» maintenance workshop; and

» recreational facilities.

The following strategies are to be incorporated into design and management of the camps:

» walkways and congregation areas are to be covered to reduce dust generation;

» facilities used shall be fully transportable with minimal disturbance following use of site;

» air conditioners installed in all buildings; and

[6] This is required as the construction camps will not be included in the designation as *Land for Community Infrastructure* as part of the designation for the rail corridor.

» pest control by a licensed operator should be undertaken on a half-yearly basis for vector and vermin control.

A fire management plan is to be prepared in consultation with the local fire service for each camp, identifying fire wardens, warning signal and evacuation and emergency procedures. All residents of the camp should be made aware of the requirements outlined in the fire management plan during induction training.

3.7 Electricity and Telecommunications

3.7.1 Electrification

Electrification of the rail line is not proposed until 2018[7]. QR has undertaken a number of preliminary studies to:

» compare electrification with diesel operation; and

» to establish the electric traction infrastructure requirements.

No further information is available on the electrification of the rail corridor. Below is a summary of QR's current electricity requirements in the region and future requirements with the electrification of the NML alignment and Newlands system.

The Queensland Electricity Transmission System is owned and operated by Powerlink Queensland, a government-owned corporation. The QR electrified network is currently supplied via 24 dedicated 132kv (110kv in the metropolitan area) substations. QR provides these substations including facilities for Powerlink terminations, switching and metering.

Currently Powerlink has adequate existing 132kv transmission lines running between Strathmore (Collinsville), Newlands, North Goonyella and Moranbah, feeding existing mine developments and QR's Goonyella system. The proposed traction feeder stations at North Goonyella, Suttor Road (if required), Newlands and Collinsville can be supplied from this line.

3.7.2 Telecommunications

The proposed telecommunications for the NML will be made up of an Optical Fibre based Synchronous Digital Hierarchy (SDH) system and an SDH Digital Microwave Radio (DMR) system which will provide an alternative path for the services such as UTC telemetry and Train Control Radio (TCR).

As it is not proposed to electrify the line until a later stage, a direct buried optical fibre cable will be installed from Riverside to Newlands. The existing Optical fibre based SDH system from Wotonga terminates at Riverside. North Goonyella is fed by a radio link and has no redundancy. SDH interface equipment will be installed at Communications Equipment Rooms (CER's) at each of the passing loops. Allowances will be made for the interfaces required when the line is electrified.

Connections to the Abbot Point to Newlands system will be made at Newlands. If required a construction radio system will be provided during the construction phase of the NML.

[7] Date is dependent upon electrification strategy and rollingstock strategy

3.8 Transport

The rail corridor will cross over two publicly controlled roads; namely the Suttor Developmental Road and the newly constructed Cerito-Elphinstone Road (between Collinsville and Newlands). The Suttor Developmental Road is presently an unsealed gravel road at the point of the rail crossing and had an average traffic count of 61 vehicles/day in 2004. The new Cerito-Elphinstone Road is expected to have heavy usage due to the Newlands mine and the ability to travel north from Glenden to Bowen via a sealed road.

It is envisaged that the major roads from Mackay and Bowen (Peaks Down Highway and Bowen Developmental Road respectively) and regional roads (Suttor Developmental Road, Cerito-Elphinstone Road, Wollombi Road, North Goonyella private mine road) will be used to transport heavy machinery and construction vehicles. The existing rail network will be used for the transportation of ballast, construction materials and track laying equipment.

Detailed information and transport volumes and routes during construction and operation are provided in Section 4.10.

3.9 Waste

Where possible, wastes generated during both the construction and operational phases will be managed in accordance with a waste hierarchy of (in decreasing order of priority) minimisation, re-use, recycling, reprocessing and disposal.

For construction and operational phases each potential waste stream will be identified along with appropriate waste management strategies and procedures. These strategies and procedures will be based on the waste hierarchy. Waste disposal and recycling facilities will be provided on site by licensed, commercial operator/s in a designated waste transfer station area. Waste will be disposed at a local council landfill as negotiated with the licensed operator, QR and the local council.

Detailed information on waste volumes, characteristics and management strategies for the project is provided in Section 4.9.

3.10 Rail Operations

Table 7 provides a summary of estimated coal haulage demand along the NML for the different stages of the project. This suggests that coal haulage demand may rise from 3 Mtpa in the first year of commissioning to 35 Mtpa as the ultimate capacity. This table shows proposed average daily train frequency along the NML from the first year of commissioning and the proposed ultimate growth (year 17 and beyond). Initially the NML will have approximately 5 train cycles per day, growing to an ultimate capacity of 29 cycles per day future[8].

[8] Train numbers have been based on a conservative 269-day year, but can run over 365 day year 24 hours per day.

Table 7 Forecast average daily train numbers and coal haulage

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Future
Average number of train services per day	5	8	7	7	9	9	9	7	7	7	7	8	13	17	17	20	22	29
Forecast Volume of Coal (Mtpa)	3	5	6	6	7	7	7	8	8	9	9	10	16	21	20	24	27	35
	Commission Stage 1A							Commission Stage 1B					Commission Stage 2			Commission Stage 3		

Note : Forecast coal volumes carried across the NML for any year may vary significantly depending on actual coal demand, coal contracts entered into by individual mines, and port and rail capacity. A mix of short and long trains is likely to be used in Stage 1A, commencing with only short trains. Timing for the introduction of longer trains may vary depending on operational requirements.

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4. Environmental Values and Management of Impacts

Each environmental value identified is described in the following section according to the following objectives:

- Describe the potential adverse and beneficial impacts of the proposal on the identified environmental values;
- Describe any likely environmental harm on the environmental values;
- Describe any cumulative values caused by the project, either in isolation or by combination with other known existing or planned activities; and
- Provide mitigation measures to minimise impacts or harm to environmental values.

4.1 Land Systems

4.1.1 Description of Environmental Values

4.1.1.1 Land Use and Infrastructure

The current land uses within the project area include beef cattle grazing, coal mining and natural environment. A number of existing and proposed water and gas pipeline easements cross or are located within the vicinity of the rail corridor. A description of these different land uses within the project area is provided below.

Further description of Native Title claimants is included in subsequent sections.

The rail corridor traverses through three local government areas, namely the shires of Belyando, Nebo and Bowen. The land is mostly zoned as Rural A, with land near Newlands Mine zoned as Rural, and land near North Goonyella mine unzoned.

Beef Cattle Grazing

The dominant land use within the project area is beef cattle grazing. The proposed rail corridor will cross seven beef cattle properties, the details of which are provided in Table 8. Additional information on affected landowners is provided in Section 4.6.

Table 8 Landowners Information

Lot Number	Property Name	Owners	Area (ha)	Holding/Title
Lot 3 CP852527	Denham Park	D V Kemp & R A Kemp	12,610	Grazing Homestead Freehold Lease
Lot 3388 PH2112	Bilyana	Bilyana Holding (E P Mason)	36,434	Pastoral Development Holding
Lot 2 DK176	Lancewood	B & J Pini	17,500	Grazing Homestead Perpetual Lease

Lot Number	Property Name	Owners	Area (ha)	Holding/Title
Lot 1 CP905226	Wollombi	G & L Perry	9,859	Grazing Homestead Perpetual Lease
Lot 689 PH2015	Suttor North	A & P Maddern	6,734	Pastoral Holding
Lot 4 DK264	-	Colinta Holdings Pty Ltd (a subsidiary of Xstrata)	17,100	Pastoral Holding
Lot 3 DK236	Byerwen	Colinta Holdings Pty Ltd	50,480	Pastoral Holding

All the cattle grazing within the project area occurs on native pastures, the majority have been directly or indirectly sown with the introduced buffel grass. Some of the properties that will be traversed have paddocks of pulled Brigalow and small areas of disk ploughed Brigalow. In the northern end of the corridor, the black soils would be suitable for cropping if there was a reliable water source.

There are numerous constructed dams and turkey nest water storage points for cattle within close proximity to the rail corridor. The rail corridor will also cross within close proximity to several cattle yards, and laneways. Many of these storages are drying out due to low rainfall and alternative or back-up water sources are being used.

The location of the above property infrastructure is provided in Figure 4-1 to Figure 4-4.

There is no land classified as Good Quality Agricultural Land as shown under the DNRM Land Classification System and described by State Planning Policy 1/92 within the project area.

There are no lots within the proposed route listed on the EPA's Environmental Management Register/Contaminated Lands Register.

Coal Mining and Petroleum Leases

A number of mining-related leases and exploration permits exist within the project area, including current exploration permits for petroleum (ATP), current exploration permits for coal (EPC) Mining Leases and Petroleum Leases.

The rail corridor will traverse over a number of EPC held by Qcoal Pty Ltd, Christopher Ian Wallin, BHP MITSUI Coal Pty Ltd (BMA), Xstrata Coal Queensland Pty Ltd, BHP Billiton Minerals Pty Ltd and Moorvale Coal Pty Ltd. The proposed rail corridor is located adjacent to the following Mining Leases:

- Moranbah North held by Moranbah North Coal Pty Ltd;
- Goonyella Coalmine held by BHP Coal Pty Ltd;
- Riverside held by BMA;
- North Goonyella held by Peabody Energy Australia Coal Pty Ltd;
- Wards Well held by BMA;
- Suttor Creek held by Xstrata Coal Queensland Pty Ltd; and
- Newlands held by Xstrata Coal Queensland Pty Ltd.

The following companies all hold ATP across the study area: BHP Coal, BNG (SURAT) Pty Ltd, and CH4 Pty Ltd. CH4 Pty Ltd holds several Petroleum Leases in the southern section of the project area near the Goonyella coalmines.

The location of these exploration and mining permits are provided in Figure 4-6.

Natural environment

The project area includes a number of natural environmental features including remnant vegetation, watercourses and the Leichhardt Range.

Several large tracts of remnant vegetation remain within the project area, including Eucalypt woodlands, Brigalow and riparian vegetation. These are discussed in more detail in Section 4.4.1.

Suttor Creek is the largest watercourse within the project area and flows east to west before joining the Suttor River. The NML crosses Suttor Creek at approximately 36 km and the creek supports a well-vegetated riparian zone in this location[9]. Detailed information on the watercourses within the project area are provided in Section 4.3.

The Leichhardt Range is located in north of the project area. The NML rail corridor crosses this range at approximately 58 km and in this location the range is characterised by rocky basalt outcrops, remnant vegetation and exposed cliffs[10].

Water and Gas Pipeline Easements

The Enertrade (North Queensland Gas Pipeline) runs to the west of the proposed railway. The nearest proximity of the gas pipeline to the railway is 125 m at the northern end and 185 m near the central section of the route.

The Sunwater water pipeline from Burdekin Falls Dam to Moranbah is located to the west of the NML. Sunwater is currently undertaking a duplication of this pipeline. The existing and proposed Sunwater pipeline crosses the NML alignment at two locations.

The location of these easements is provided in Figure 4-5.

[9] From North Goonyella

[10] From North Goonyella

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Figure 4-1 Southern Section - Alignment and existing infrastructure

Figure 4-2 Central (south) Section - Alignment and existing infrastructure

Figure 4-3 Central (north) Section - Alignment and existing infrastructure

Figure 4-4 Northern Section – Alignment and existing infrastructure

Figure 4-5 Land use along the Northern Missing Link alignment

Figure 4-6 Mining, petroleum and exploration leases within Project Area

Stock Routes, Road Reserves and Powerline Easements

Three stock routes are located within the project area. Two of these stock routes are fenced in by landowners and currently not being used. The third route is located along Eaglefield Creek, however it is understood that cattle are instead driven down the Suttor Development Road to move cattle between properties. A fourth stock route is located immediately to the north of the alignment in Byerwen Station and will not be affected by the operation of the rail corridor.

There are several minor powerlines within the project area to service the mines and local landowners. Telstra advise that CDMA coverage towers exist in the vicinity of the proposed railway.

The rail corridor will cross two publicly controlled roads; namely The Suttor Developmental Road and a newly constructed road between Collinsville and Newlands (Cerito-Elphinstone Road).

The Suttor Development Road is presently an unsealed gravel road at the point of the rail crossing and had an average traffic count of 61 vehicles/day in 2004. The point where the rail corridor crosses the road is at the base of a small rise (for westward travelling vehicles), which may pose some restrictions for motorists to view passing trains until approximately within 200 m of the crossing. Figure 4-7 shows the motorist view of the proposed crossing location from the top of the rise.

Queensland Department of Main Roads (DMR) is currently constructing the Cerito-Elphinstone Road. This new road connects the sealed road from Newlands Mine (the main connection from the mine to Glenden) to the village of Cerito (which is connected to the sealed Bowen Developmental Road). Currently traffic use unsealed dirt and gravel roads from Glenden to the Bowen Developmental Road. It is understood that during wet weather these roads become difficult to pass. This new road is expected to have heavy usage due to the Newlands mine and the ability to travel north from Glenden to Bowen via a sealed road.

Figure 4-7 View west from top of rise on the Suttor Developmental Road towards proposed rail crossing (at base of rise)

Beef cattle grazing in study area

Stockyards within study area

Newlands coal loadout facility

Leichhardt Range

Suttor Creek

Existing farm dam

Figure 4-8 Photos of land uses and infrastructure within the Project Area

4.1.1.2 Topography/Geomorphology

The topography of the project area ranges from flat basaltic and clay plains to undulating sandstone rises/tablelands and rocky basaltic plugs. The major feature of the project area is the Leichhardt Range in the north.

North of where the rail corridor crosses the Leichhardt Range the topography is relatively flat and consists of basalt derived black soils which support extensive native grasslands.

The Leichhardt Ranges consists mainly of moderate or strongly undulating lands with stony low hills, benches, bluffs, and rocky outcrops. The range is comprised of tertiary volcanics, which are basaltic and underlain by Bulgonunna and Oligocene-Miocene sediments. Some isolated low ranges present gentle slopes, with alluvial plains and braided channels found along many stream tracts.

South of the Leichhardt Range are undulating plains with occasional lateritic and sandstone scarps and low mesas. This area consists of late Cainozoic floodouts and residual sand, soil and gravels. Small areas belonging to the Back Creek Group also feature in the middle section of the route.

The topography in the southern section of the project area surrounding North Goonyella is flat, lowland Brigalow country, which has been cleared extensively for grazing. This area is a composite of Quaternary alluviums and Betts Creek beds from the Blackwater Group.

4.1.1.3 Soils

The land systems along the rail corridor are varied, consisting of weathered basalts and alluvial plains. The main soil types crossed by the rail corridor include:

- Finely structured, self mulching clays;
- Yellow, brown and red duplex soils;
- Massive earths; and
- Deep sandy soils.

The relatively low rainfall and high evaporation typical of this region largely eliminates leaching in all but the most permeable coarse-textured soils. The accumulation of organic matter (including nitrogen) is low due to seasonal aridity, high temperatures and low humidity.

West of the Newlands mine the soils are black cracking clays, derived from basalt. To the southwest of mine, the dominant soils are shallow mostly stony dark clays and more friable shallow stony clays. Some small areas of brown or red clays occur locally. Small alluvium plains may occur in association with drainage lines, which have deep clay soils that have a high water holding capacity, but poor drainage and aeration. Red earths are prominent in the ridges and slopes south of Newlands mine. Red earths characteristically have weak profile differentiation with gradual or diffuse horizon boundaries. These soils are typically nutrient-poor and highly permeable, with friable moist consistency. In addition, these areas of soil have highly dispersive properties due to high sodium contents occurring within the Leichhardt ranges as a result of salinisation and leaching. Extensive areas of gully erosion are present in these soils, where the ground as become disturbed or tree cover removed. An example of this near the location of the preferred alignment is shown in Figure 4-9.

Further south of the Leichhardt Range, the route is typified by undulating lands of lateritic and sandstone mesas, with leached sands and sandy red earths present on the low mesas. These soils are generally

shallow containing a large proportion of fragmented rock. The physical status of these soils is generally poor due to shallowness, stoniness and free drainage.

Clay plains are also present along sections of the corridor, with dominant soils comprised of deep grey clays and deep brown clays. In some areas, these occur on Gilgai banks, and are often associated with loamy duplex soils[11]. These soils have low permeability, and feature deep cracking of the profile when dry. Swelling and Gilgai are enhanced by significant sodium saturation of the clay in many profiles. Gilgai is a variable, often strongly developed feature, ranging from small mounds a metre or two across raised 15 to 30 cm above the general level to the extreme melon-hole forms of the Brigalow and Gidyea lands with microrelief of 1-2 m and closed depressions from a few to more than 20 m across. Large areas in the southern and central part of the rail corridor are dominated by Gilgai landscapes (Figure 4-9).

Slightly acidic loamy red earths occur approximately halfway along the proposed route.

On the low dissected kaolinized sandstone mesas and pallid-zone scarps, shallow stony sands are common, associated with very pale sandy or loamy duplex soils. Throughout this unit adjacent to drainage lines are small plains of alkaline loamy duplex soils. The undulating plains closer to Goonyella feature sandy red and yellow earths, often with areas of gilgaied cracking clays.

A soil map of the project area is provided in Figure 4-10 and description of the soil map units provided in Table 9.

Existing gully erosion along a section of the preferred alignment

Example of Gilgai found along the rail corridor

Figure 4-9 Soil characteristics along proposed alignment

[11] Gilgai refers to the microrelief of soils produced by expansion and contraction caused by changes in moisture. Gilgai is found in soils that contain large amounts of clay, which swells and shrinks noticeably with wetting and drying. It usually occurs as a succession of microbasins and microknolls in nearly level areas or as microvalleys and microridges parallel to the direction of the slope.

Table 9 Descriptions of soil map units within the Project Area

Soil Map Unit	Description
My28	Gently undulating lands with broad ridge crests and low rises: dominant soils are loamy or occasionally sandy red earths (Gn2.12), less often (Gn2.11). Associated are lesser loamy or sandy yellow earths (Gn2.22). On lower slopes and in drainage depressions loamy duplex soils (Dy3.43 and Dy3.42), and similar (Dy2) soils occur. Occasionally present are low lateritic scarps with shallow stony loams (Um1.43) and (Um4.1). Included in the unit, as mapped, are small areas of gilgaied cracking clays similar to units CC21 and CC33.
CC33	Level alluvial flood-plains associated with major streams, often dissected by numerous braided channels and mostly subject to irregular flooding: dominant soils are deep grey clays (Ug5.24 and Ug5.25) with smaller areas of black or brown clays (Ug5.15) and (Ug5.34); in certain areas the clays may be moderately gilgaied (1-2 ft). Other clays occurring (Ug5.5) and (Ug5.4) have a massive surface. Small levees adjacent to some stream channels have other uniform-textured soils (Uf6.32) and (Um5.4), together with small areas of loamy duplex soils (Dd1.13) and (Dy2.33).
MM7	Moderate to gently undulating lowlands and plains: dominant soils are moderately deep to deep clays, which in some areas have a moderate gilgai microrelief (1-2 ft). In some areas the soil surface may be strewn with silcrete (billy) gravel to 4 in. diameter. Brown clays (Ug5.34, Ug5.38, Ug5.32, and Ug5.37) are dominant but grey forms (Ug5.25, Ug5.24, and Ug5.22) are also common; dark clays (Ug5.13, Ug5.15, and Ug5.16) also occur. Closely associated are thin-surfaced loamy duplex soils, chiefly (Dr2.13 and Dr2.33), (Db1.13 and Db1.33), and (Dy2.33 and Dy2.43), which occur particularly on flood-plains of small streams. Small areas of friable earths (Gn3.13 and Gn3.12) also occur, particularly where the unit borders the high mountains of unit Bz1.
Ke19	Gently to broadly undulating plains interrupted by some stony ridges, basalt flow scarps, broad low hill crests, or occasional low conical hills: dominant soils are shallow to moderately deep dark grey or dark brown cracking clays (Ug5.12), with lesser (Ug5.13 and Ug5.14). Linear gilgai often occurs on slopes. Also occurring are areas of dark red or red-brown clays (Ug5.37, Ug5.38, and Ug5.32) usually on higher landscape sites. In lower areas small level plains occur, often as narrow flood-plains adjacent to streams. The soils are deep dark clays (Ug5.15 and Ug5.16) with smaller areas of (Uf6.32 and Uf6.31). On higher stony ridges shallow clay soils (Uf6.31), (Uf6.32), and (Ug5.12) occur. Locally there may be small areas of highly calcareous clays (Ug5.11).
Sl21	Gently undulating plains: dominant are loamy duplex soils with a slightly gravel-strewn surface. The chief forms are (Dy2.43) and (Dy2.33) but (Db1.33), (Db1.13), (Db1.43), and similar (Dy3) soils are often closely associated. Also occurring are smaller areas of slightly gilgaied (1-2 ft) or non-gilgaied grey clays (Ug5.24), or less commonly brown clays (Ug5.34). In addition there are occasional low rises of loamy or sandy red earths (Gn2.12) and yellow earths (Gn2.22). In some localities there may be occasional high stony ridges with shallow stony soils (Uc1.21), (Uc2.12), (Um1.41), and (Um4.1).
Tb19	Undulating to hilly with some flatter ridge tops and river valleys: undulating to hilly areas of hard acidic yellow mottled soils (Dy3.41) with some (U) soils and rock outcrops, in association with flat to undulating ridge-tops of dark cracking clays (Ug5.12): gorges and steep-sided stream valleys of cracking clays (Ug5.1), other (U) and also (Dy) soils and rock outcrops; some small floodplains of undescribed soils.

Soil Map Unit	Description
Mz17	Undulating lands with occasional lateritic scarps and low mesas: dominant soils are slightly acid loamy red earths (Gn2.11) which often contain many ironstone nodules at depth. Associated are neutral loamy red earths (Gn2.12), and lesser loamy yellow earths (Gn2.22 and Gn2.25). The soils of the scarps and mesas are loamy red earths (Gn2.12) on the more extensive surfaces, elsewhere shallow stony loams (Um1.43) and (Um4.1) are common. On scarp slopes and in local depressions loamy duplex soils (Dy3.43) and (Dy2.43) occur. Marginally the unit may grade into or be closely associated with red and brown cracking clays (Ug5.38) and (Ug5.34), which have slight to moderate gilgai microrelief.
Mz18	Gently undulating plateau surface, often bounded by steep lateritic scarps where marginally dissected: dominant soils are deep slightly acid loamy red earths (Gn2.11), with some small marginal areas of loamy yellow earths (Gn2.21). The marginal lateritic scarps have shallow red earths (Gn2.11) and stony loams (Um1.43) and (Um4.1), also less commonly (Uc2.12). Elsewhere the margins of the unit have the sands of unit Bz9. Small dissected mesa remnants are also included in the unit.
Bz9	Low hilly or strongly undulating lands with some lateritic or sandstone mesas: dominant soils are deep sands (Uc1.21), but on the low mesas are leached sands (Uc2.12) and sandy red earths (Gn2.11). On the outwash slopes sandy duplex soils (Dy5.41 and Dy5.42) occur.
Kb11	Moderate or strongly undulating lands with stony low hills, benches, and bluffs; rock outcrops common: dominant soils are shallow mostly stony dark clays (Ug5.12, Ug5.13, and Ug5.14) and more friable shallow stony clays (Uf6.32 and Uf6.31), or clay loams (Um1.43 and Um1.41). Small areas of brown or red clays (Ug5.32 and Ug5.37) occur locally. Small alluvial plains may occur in lower sites which have deep clay soils (Ug5.15 and Ug5.16).

Figure 4-10 Soil map of the study area

4.1.2 Potential Impacts and Mitigation Measures

4.1.2.1 Land Use and Infrastructure

Land Uses

The proposed project will have potential impacts on each of the various land uses within the study area.

The dominant land use that the rail corridor directly and negatively impacts is beef cattle grazing. Potential impacts include:

» Fragmentation of grazing paddocks, in particular the important 'fattening' or finishing paddocks (commonly referred to as Bullock paddocks). Graziers use these paddocks to fatten cattle before they are sent off to market and fragmentation will affect the ability of the grazier to move cattle to differing paddocks. This is discussed further in Section 4.6.3.

» Disruption/loss to cattle yards and purpose built cattle laneways. Most landowners use purpose cattle laneways to efficiently move stock from various sections of their properties to central cattle yards. On several of the properties the rail corridor will cross these laneways, potentially impacting on the ability of cattle to be moved efficiently. This impact may result in the requirement to employ additional farm hands to muster and move cattle. This is discussed further in Section 4.6.3.

» Potential increase to the risk of fire within the landscape as a consequence of sparks from diesel engines and limited ability to fight fires by restricting access to sections of the land with suitable machinery (such as tracked machinery).

Underpasses and level crossings have been provided on each of the properties to allow, stock, vehicles and machinery to cross the rail line, this is discussed in more detail in Section 4.6.3.

The rail corridor will have a beneficial impact to the surrounding coalmines, as it will allow for improved efficient and viability in the transport of coal to the export ports and the ability for these mines to access the rail corridor network through construction of balloon loops. The rail corridor will also foster the development of new mines in the area, as it will be more economical to transport the coal to export terminals. The rail corridor will not result in the sterilisation of known mining leases as QR has undertaken considerable consultation with the various coal companies in the region (namely Xstrata and BMA). This consultation has ensured that the rail corridor will avoid the locations of proposed future coalmines and mining leases.

Infrastructure

No major infrastructure, other than the Sunwater pipeline, will be impacted directly by the project. The existing Sunwater pipeline crosses the NML alignment at two locations. In both cases, the NML has been graded to cross the pipeline on a shallow embankment, thereby avoiding the requirement to lower the pipes. Discussions with Sunwater confirmed that concrete encasing of the pipeline will be required. Sunwater are in the process of duplicating the water pipeline and the additional work to protect the existing pipeline from railway construction will be undertaken at the same time.

Impacts to the local road system will be minor, as the rail corridor will only cross two public maintained roads (Suttor Developmental Road and the Cerito-Elphinstone Road). Based on the low existing traffic volumes on the Suttor Developmental Road, the 'TAADT' as defined in the 1989 Main Roads Department (now DMR) publication "*A Guide to the Signing and Control of Railway and Tramway Crossings*" warrants an at-grade crossing (this is discussed further in Section 4.10.4.2).

It is expected the traffic on the Cerito-Elphinstone Road will be relatively heavy, and therefore grade separation has been assumed. An allowance has been made for a road over Rail Bridge in the design and costing. A risk assessment to determine the required level of protection will be completed as part of detailed design of the rail corridor (this is discussed further in Section 4.10.4.2).

For more information on impacts to the local road network refer to Section 4.10.

4.1.2.2 Topography/Geomorphology

The change in level over the entire length of the corridor is less than half of one degree, and testifies to the gentle relief encountered along the alignment generally. The topography consists of low, gently sloping hills, with "plateau-like crests", particularly in southern parts of the alignment. In the north, beyond 60 km, steeper slopes are encountered within the basalt underlain areas, although the alignment generally avoids these hilly parts[12].

Given the relatively flat topography of the project area the rail corridor will have minor impacts to local topographical features, with all cuttings and embankments generally accommodated within a 60 m wide corridor. The maximum cutting depth is 12.756 m (at ~52 km) and the highest embankment is 11.353 m (at ~25 km)[13]. Through the Leichhardt Range, the alignment has been positioned to avoid affecting the characteristic topographical features (i.e. rocky basalt outcrops) and only minor cuttings are required.

QR is willing to undertake the following mitigation measures for areas that are likely to require large amounts of earthworks, such as creek crossing, cuttings, embankments and borrow pits.

QR is committed to undertaking the following measures to minimise the impact of the rail link on the topography and landscape.

Management Commitments
1. Sites are to be re-contoured to a stable form that resembles the surrounding landscape.
2. Where re-planting/re-vegetation is required native species are to be used and any re-vegetation efforts within the black soils of the northern section of the corridor are to include seeds of the threatened *Dichanthium queenslandicum*.

4.1.2.3 Soil Erosion

It is expected that the erosive potential of the soils within the project area would range from low to moderate. Duplex soils are highly susceptible to rill and sheet erosion following disturbance, as finer soils overlay denser cohesive subsoils. Sandy soils and self mulching clays are susceptible to wind erosion, due to their small particle size. The self mulching clays are generally well structured at depth and therefore have a low overall erosion potential.

Examination of the NRM Burdekin Catchment Salinity Hazard Map shows that the project area has a low to moderate salinity hazard potential.

Potential impacts of the rail corridor on the soil environment include:

» Increase in soil erosion, especially at sensitive sites, such as creek crossings during construction and on-going during operation;

[12] From branch off at the North Goonyella system

[13] From branch off at the North Goonyella system

- Increase in extent of sites of erosion due to loss of tree cover, removal and disturbance to the top soil and exposure of dispersive sub soils;
- Loss of top soil due to water and wind erosion during construction phase; and
- Reduction in downstream water quality a result of erosion and increase of sedimentation in waterways, especially in farm dams where the rail corridor crosses the local catchment area.

It is understood that the construction of the rail corridor will take approximately 18-24 months and therefore the construction phase should be timed to maximise period within the dry season (refer to Section 4.2).

Particular care is to be undertaken in the vicinity of drainage lines and locations with red earth soils, as these latter soils have a weak profile differentiation and highly dispersive properties due to high sodium contents.

QR is committed to undertaking the following measures to minimise the potential of soil erosion along the alignment.

Management Commitments

3. Management measures provided outlined in the EMP (Section 5.8.1.1) and sediment and erosion control structures and techniques outlined in *Soil Erosion and Sediment Control-Engineering Guidelines for Queensland Construction Sites (1996)* will be implemented.

4.1.2.4 Geotechnical Constraints

Observations and preliminary investigations of the soils have identified that dispersive and expansive soils may pose significant geotechnical constraints on the project. Moreover, the widespread occurrence of expansive black soils in low-lying areas of the landscape, and dispersive soils, which may be complicit in ongoing formation problems along the corridor, could necessitate the removal and replacement of large stretches of sub-grade materials as part of embankment construction.

4.2 Climate

The project area experiences a semi-arid climate characterised by high temperatures in summer and moderately high temperatures in winter. The rainfall exhibits a distinct seasonal pattern with most rainfall experiences in the summer months.

The Australian Bureau of Meteorology operates a synoptic station at the Moranbah Water Treatment Plant, south of the Moranbah rail station. The weather station has recorded most temperature, humidity and wind speeds over a period of approximately 18 years, and rainfall data over a period of approximately 30 years.

As shown in Figure 4-11 below, Moranbah experiences a hot climate with mean daily maximum temperatures ranging from 34.2^{o}C in January to 23.6^{o}C in July. Monthly averages of daily minimum temperatures range from 22 ^{o}C in January to 9.7 ^{o}C in July.

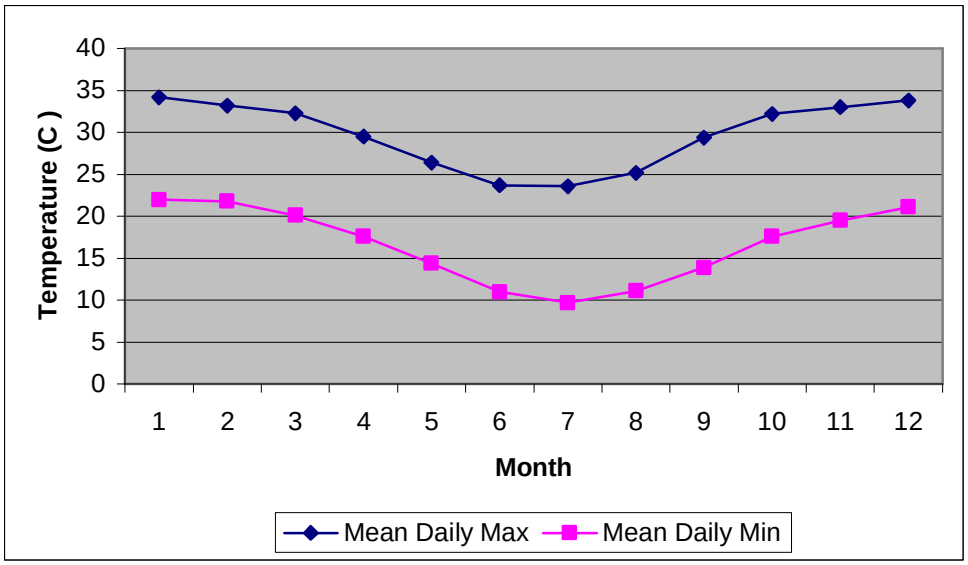

Figure 4-11 Monthly Temperature Averages (Moranbah Water Treatment Plant) (data from Bureau of Meteorology)

The relative humidity of the area does not vary significantly, with average 9 am annual humidity at 67. The graph below demonstrates the variability of humidity throughout the year.

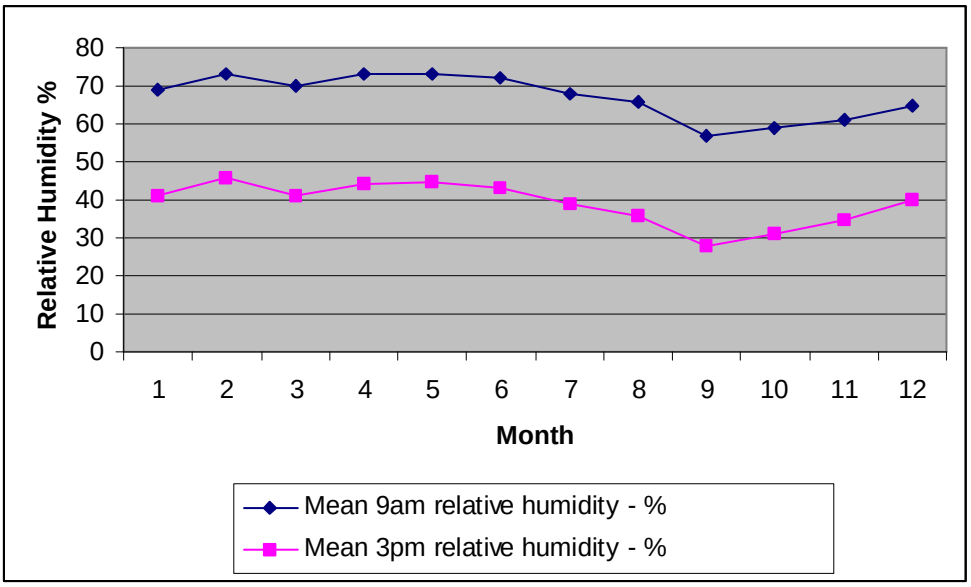

Figure 4-12 Relative Humidity (Moranbah Water Treatment Plant) (data from Bureau of Meteorology)

As shown in Figure 4-13 below, January and February are the wettest months of the year on average in Moranbah, receiving mean monthly rainfall of 94.8 mm and 90.4 mm respectively. The driest months of the month on average is July receiving only 17.1 mm. The mean annual rainfall is 589.5 over an average of 54.5 rain days throughout the year.

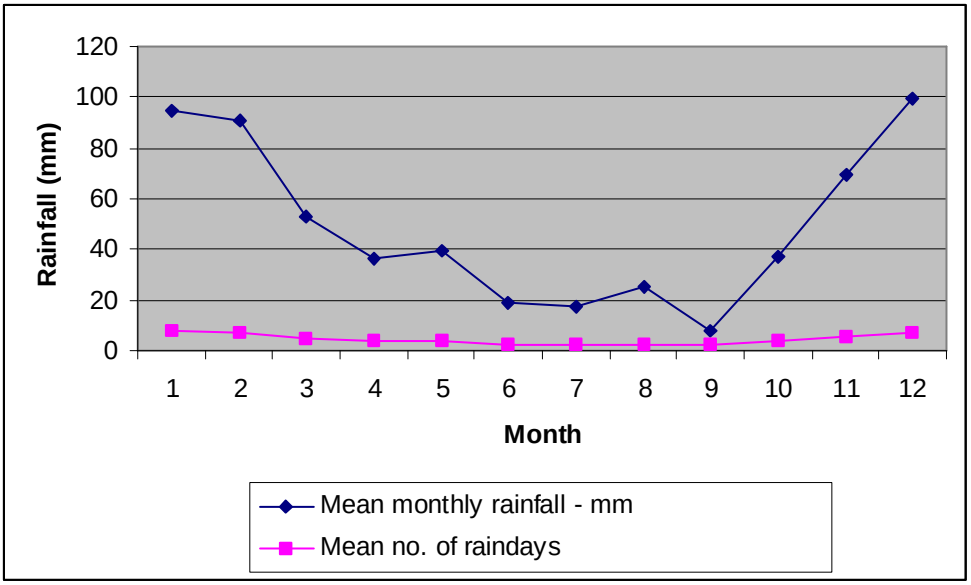

Figure 4-13 Monthly Averages of Rainfall (Moranbah Water Treatment Plant) (data from Bureau of Meteorology)

Given that the region experiences a semi-arid climate no specific requirements for monitoring weather changes are recommended. In the event of forecasted heavy rain or storms (generally in the summer months) the condition of erosion/stormwater control structures is to be checked to ensure they are working effectively.

4.2.1 Construction timing

Based on the rainfall patterns in the region, where possible QR is committed to the following.

Management Commitments

4. Majority of construction activities including construction of bridge over Suttor Creek will be planned to occur, to the extent possible, during dry periods.

4.3 Water Resources

4.3.1 Description of Environmental Values

4.3.1.1 Surface Waterways

Regional Catchment

The majority of the rail corridor is located within the 73 828 km^2 Belyando/Suttor sub-catchment which forms part of the 136 000 km^2 Burdekin Basin catchment. The Belyando/Suttor catchment represents a drier, more variable and typically semi-arid landscape and produces unreliable stream flow, contributing comparatively less to the overall discharge from the Burdekin Basin than the other sub-catchments in the basin (NRM 2002). It is not uncommon for more than 80% of the annual stream flow of the waterways in the Belyando/Suttor sub-catchment to occur between December and April, with no flow between May and November. Within the Belyando/Suttor catchment there are no existing major water infrastructure, however, a number of private weirs, pumps and off-stream storages licensed for waterharvesting and

irrigation have been constructed to take advantage of the intermittent unsupplemented supplies. Licensed irrigators tend to be concentrated in areas with suitable alluvial plains adjacent to the Suttor and Belyando Rivers and their tributaries (NRM 2002). The turbidity of waters from the Belyando/Suttor sub catchment is extremely high as a result of high rates of erosion (NRM 2002). Levels of salinity in the Belyando/Suttor sub-catchment waters are generally well within guideline limits.

Local waterways

The rail corridor crosses a number of small creeks and drainage lines including Kennedy and Eaglefield Creeks, and the larger Suttor Creek. All surface water drains inland from east to west into the Belyando/Suttor River catchment. All the waterways within the project area are ephemeral and have very low surface flows, with the majority of surface flow experienced during flood and high rainfall events in summer. At the time of the field visit to the project area in August and September there was no flow in any of the waterways.

There is no known water quality data available for the waterways within the project area. Work undertaken by CSRIO shows that generally within the Burdekin basin, ambient water quality appears to be closely related to the influence from localised effects, rather than with catchment wide processes (Roth *et al* 2002). The main factors influencing water quality, other than changes in flow, is the local land use, such as livestock and feral areas loitering in waterways and disturbance to riparian zones.

A stream gauging station is located on the Suttor River at Bilyana Station (approximately 28 km downstream from the rail line crossing). A summary of the flow through this station is provided in Table 10. Figure 4-14 provides a plot of the monthly flow at the gauging station from 1/10/1966 to 1/10/2004. This shows that the highest monthly flow occurred in February 1991 of 421 830 ML.

Table 10 Summary of stream discharge at Suttor River, Eaglefield (1/10/1967 – 03/01/2005) (NRM, 2005)

Description	Discharge (ML)
Total stream discharge	3 775 668 ML
Minimum annual discharge	335 ML
Maximum annual discharge	747 054 ML
Mean annual discharge	102 045 ML

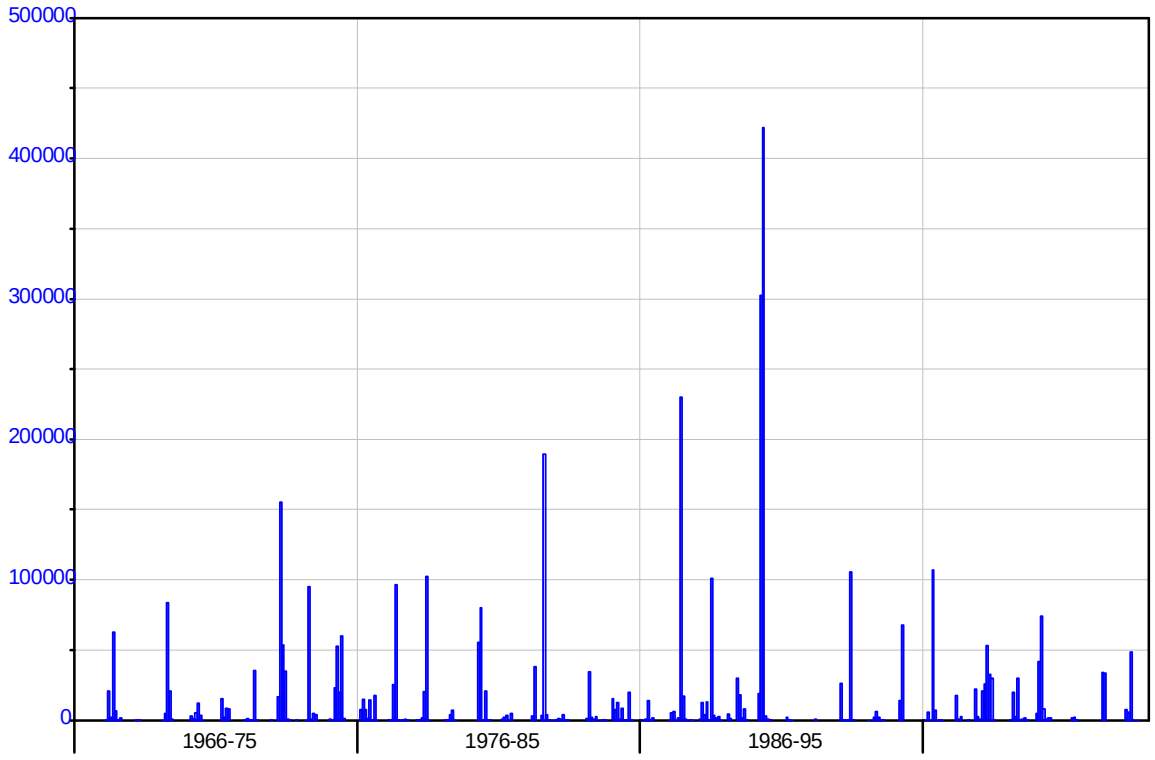

Figure 4-14 Plot of stream flow at Suttor River, Eaglefield (1/10/1966-1/10/2004) (NRM, 2005)

Suttor Creek is the largest waterway within the project area and the rail corridor crosses it at 36 km [14]. At the point of crossing the creek has high steep banks and a wide sandy creek bed (Figure 4-15). The creek has a wide and well-established riparian zone, with numerous large *Eucalyptus tereticornis* (Blue gums) lining the bank.

Kennedy and Eaglefield Creeks are much smaller waterways and are located on the clay plains in the southern half of the rail corridor. These will be crossed at 14 km and 19 km respectively. Both creeks have small-incised banks and narrow creek beds (Figure 4-15), their relatively narrow (<10 m) riparian zones are dominated by Brigalow[15]. The remaining waterways within the project area range from undefined drainage channels within minimal vegetative cover to more defined gullies, some with riparian cover dominated by Brigalow (Figure 4-15). Appendix E provides horizontal and vertical drawings of the rail corridor, including locations of planned creek crossings.

There is limited information available on flooding within the study area. Floods are limited to the higher rainfall months of December to April.

[14] From branch off at the Goonyella system

[15] From branch off at the Goonyella system

In addition the local waterways, the project area contain several farm dams and turkey nest storage dams to capture surface flow for stock and domestic water supply. A number of these dams are located within several hundred meters from the rail line.

Suttor Creek at point of crossing

Eaglefield Creek at point of crossing

Waterway within central section of project area at point of crossing

Figure 4-15 Photos of Waterways within the Project Area

4.3.1.2 Groundwater

The project area lies on the easterly edge of the Great Artesian Basin and forms part of the intake area. Very few porous rock type aquifers are present within the Bowen Basin and little local information exists with respect to groundwater in the study area.

Discussions with local landowners indicated that there are few high yielding ground water bores within the region and most groundwater associated with the coal seams is moderately to highly saline, very high in magnesium and sulphur and generally not suitable for stock or potable drinking water.

One study undertaken for the mines in the south of the project area recorded ground water associated with the Goonyella mining system to be hypersaline (up to 20 000 us/cm conductivity).

4.3.2 Potential Impacts and Mitigation Measures

4.3.2.1 Surface water

Construction activities have the potential to impact on surface water quality within the project area (both in creek and farm dams). Potential impacts include:

» Increase in sediment loads in runoff;

» Contamination from fuel/oil/chemical spills; and

» Transfer of weed seeds from construction machinery and vehicles.

As there is currently no flow within the creeks, impacts to water quality as a result of sedimentation may be delayed until rainfall events, where there is sufficient water to cause erosion from disturbed banks, soil stockpiles and cleared areas. To minimise impacts, QR will ensure that appropriate sediment and erosion control techniques as outlined in *Soil Erosion and Sediment Control-Engineering Guidelines for Queensland Construction Sites* (1996) are implemented. Sediment control measures should include the minimisation of disturbed areas, progressive revegetation and construction of temporary and formal sediment control devices. Section 4.1.2 provides measures to limit erosion and sedimentation caused by the project. Section 4.4.1 provides measures for the re-vegetation of creek banks and other areas disturbed by construction activities.

Accidental spills of fuel/oil/chemical during construction may result in contamination of the waterways. All fuel, chemicals and other hazardous materials that may be kept on site are therefore required to be stored in bunded or sealed areas at least 100m away from waterways, drainage lines and farm dams to avoid spillage and contamination of water. All vehicles and equipment are to be maintained in accordance with manufacturers recommendations and checked regularly for possible fuel, oil and chemical leaks.

Given the minimal flow in the project area no management measures are made to monitor downstream water quality prior, during or after the construction. However, during high rainfall events, visual inspection of drainage channels downstream of construction site/s will be undertaken to monitor for presence of oil spills (slicks on water surface), high sediment levels and presence of rubbish washed from the construction site. Should oil spills or high sediment levels be observed, additional measures will be implemented to mitigate further impacts (such as checking of sediment control devices, bundings). This is addressed further within the EMP (Section 5).

Measures have been provided in Section 4.4.1 for the management of weed and seeds transfer along the alignment.

The rail corridor and associated access track has the potential to alter the drainage patterns within the area, thereby affecting viability of farm dam catchments and causing new drainage channels. To minimise the impact to drainage patterns, suitable drainage structures have been provided for the project. A summary of these structures is provided in Table 11. These structures have been designed to accommodate a 1 in 50 year flow event. Bridges have been provided for the three main creek crossings

(Kennedy, Eaglefield and Suttor creeks). These structures have been designed to AS:5100 STANDARD. No levee banks or stream diversionary constructions are proposed for the project.

Table 11 Summary of Proposed Drainage Structures along Rail Corridor

Catchment Area (km^2)	Waterway Name (if applicable)	50 year Flow Rate (m^3/s)	Culvert Size
1.7		13.24	2 No. 1650 dia CMP
4.1		27.49	2 No. 2100 x 1800 RCBC
2.6		16.31	2 No. 1800 dia CMP
20.9		70.94	19 No. 2700 x 600 RCBC
16.0		81.40	7 No. 2100 dia CMP
3.0		17.76	3 No. 2400 x 900 RCBC
35.9	Kennedy Creek	109.78	Bridge Structure
1.1		10.92	2 No. 1650 dia CMP
1.0		11.09	2 No. 2400 x 900 RCBC
176.6	Eaglefield Creek	399.63	Bridge Structure
3.2		23.01	2 No. 2100 x 1500 RCBC
6.9		43.27	Bridge Structure
1.2		36.03	10 No. 2700 x 600 RCBC
0.4		9.34	2 No. 1500 dia CMP
0.5		9.70	2 No. 1500 dia CMP
1.4		27.15	4 No. 2700 x 900 RCBC
16.9		113.32	5 No. 3000 x 2100 RCBC
2.8		40.32	3 No. 3600 x 1200 RCBC
1.3		18.72	5 No. 2700 X 600 RCBC
1.2		23.27	6 No. 2700 X 600 RCBC
36.9	Suttor Creek tributary	112.64	Bridge Structure
672.6	Suttor Creek	564.69	Bridge Structure
0.9		25.82	1 No. 3600 X 1800 RCBC
0.5		13.68	2 No. 1800 dia CMP
0.9		20.42	2 No. 2700 x 1200 RCBC
0.7		16.97	1 No. 3000 x 1500 RCBC

Catchment Area (km^2)	Waterway Name (if applicable)	50 year Flow Rate (m^3/s)	Culvert Size
61.1		170.96	Bridge Structure
2.1		19.35	3 No. 2700 x 900 RCBC
23.2		95.78	8 No. 2100 dia CMP
4.9		45.16	4 No. 2100 CMP
5.2		53.82	5 No. 2100 CMP
2.8		56.47	8 No. 2700 x 900 RCBC
6.6		68.31	10 No. 2700 x 900 RCBC
35.2		126.00	5 No. 3600 x 1800 RCBC
0.9		12.29	2 No. 1650 dia CMP
0.9		12.29	4 No. 2400 x 600 RCBC
3.6		33.95	5 No. 1650 dia CMP
0.5		9.55	3 No. 2400 x 600 RCBC
2.7		33.96	2 No. 2400 x 1800 RCBC
0.3		6.09	2 No. 2400 x 600 RCBC

RCBC – Reinforced Concrete Box Culvert

CMP – Corrugated Metal Pipe

A summary of the measures QR is committed to undertaking to minimise impacts to surface water during construction and operation are provided below.

Management commitments
5. Appropriate sediment and erosion control techniques as outlined in *Soil Erosion and Sediment Control-Engineering Guidelines for Queensland Construction Sites* (1996) will be implemented.
6. Fuel, chemical and other hazardous materials will be stored in bunded or sealed areas as per Australian Standards and located at least 100m away from waterways, drainage lines and farm dams and spills to be cleaned up immediately and in accordance with guidelines and provided spill kits.
7. All vehicles and equipment are to be maintained in accordance with manufacturers recommendations and checked regularly for possible fuel, oil and chemical leaks.

4.3.2.2 Groundwater

The construction and operation of the rail line should have minimal impacts to local groundwater quantity, especially if water for construction activities is to be sourced from the Sunwater pipeline.

Activities associated with rail line construction such as the storage fuel/oil/chemicals and sewerage septic systems of the camps could potentially impact on local ground water quality. To avoid impacts on groundwater the following measures will be undertaken.

Management commitments
8. Fuel, chemical and other hazardous materials will be stored in bunded or sealed areas as per Australian Standards and located at least 100m away from waterways, drainage lines and farm dams and spills to be cleaned up immediately and in accordance with guidelines and provided spill kits.
9. Construction camp septic system will be of sufficient size to accommodate the anticipated workforce number (~200) and discharge will positioned away from drainage lines and regularly maintained by a licensed waste contractor.

4.4 Nature Conservation

4.4.1 Terrestrial Flora

Specialist field botanist Dr Mike Olsen from Landscape Assessment, Management and Rehabilitation Pty Ltd (LAMR) and ecologist Lucy Eykamp from GHD Pty Ltd undertook a four-day field survey (5 – 8 September 2005) of potential habitats for rare and threatened flora along the preferred alignment. During the survey it became apparent that there was a need to review and revise the existing Certified Regional Ecosystem (RE) mapping along the alignment. Subsequently, a ground truthing exercise of the regional ecosystems was also completed. Dr Olsen had previously undertaken a two-day survey in February along the southern section of the preferred alignment.

Dr Olsen's report is provided in Appendix F, with a summary of the findings is provided below.

4.4.1.1 Description of Environmental Values

The rail corridor is located within the Brigalow Belt Bioregion, primarily within its northern section. It is characterised by flora and fauna species of open woodland, including the widespread leguminous tree Brigalow (*Acacia harpophylla*). Other vegetation communities include native grasslands, dry semi-evergreen vine thickets, eucalypt woodlands and forests, and riparian ecosystems.

The majority of the project has been cleared for cattle grazing; areas of intact woodlands are located mainly on poorer quality soils associated with ridgelines and escarpments. All of the vegetated areas within the project area are subject to grazing pressure by cattle and the diversity and quality of the vegetation reflects this disturbance. There are no conservation or reserve areas within the project area.

A large stand of remnant vegetation is located within the central portion of the study area. This stand contains a mosaic of different communities and in conjunction with riparian vegetation along Suttor Creek provides continuous connectivity to other vegetated areas in the landscape. The Leichhardt Range to the north of the project area also provides a continuously vegetated corridor within the predominantly cleared landscape.

Regional Ecosystems

RE mapping obtained for the project area was ground truthed during the field survey. During the field survey it was noted that there was substantial disparity between the certified mapping and the occurrence of remnant vegetation on the ground. These disparities are likely to be a reflection of the differences in scales of mapping (REs are mapped at a scale of 1:100 000 in comparison to the detailed assessment undertaken for this survey). A comparison of these differences is provided in Table 13.

Under the VMA 1999 remnant vegetation is defined as vegetation[16]:

» covering more than 50% of the undisturbed predominant canopy;

» averaging more than 70% of the vegetation's undisturbed height; and

» composed of species characteristic of the vegetation's undisturbed predominant canopy.

Given this disparity, the REs on the ground were re-mapped and this mapping is provided in Figure 4-16. Within this report, the definition of a RE follows that provided by Sattler and Williams (1999), i.e. a vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil. Each RE is assigned status under the VMA as 'Endangered', 'Of Concern' or 'Not Of Concern'. For the purposes of this report, the status of RE's follows by Young and Dillewaard (1999) in Sattler and Williams (1999) and presented in the Regional Ecosystem Description Database (REDD, Version 4.2) published by the Queensland Herbarium, EPA (2005).

[16] Part of which forms the predominant canopy of the vegetation

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Figure 4-16 Regional Ecosystems

A total of 20 REs are located within or adjacent to the rail corridor, brief descriptions of these and their conservation status under the VMA 1999 and EPBC Act 1999 is provided in Table 12. Photos of these REs are provided in Figure 4-17 and Figure 4-18.

Table 12 Regional Ecosystem Descriptions and Conservation Status

RE	Description[17]	Conservation Status	
		VMA	EPBC
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	E	E
11.3.2	*Eucalyptus populnea* woodland on alluvial plains	OC	-
11.3.10	*Eucalyptus brownii* woodland on alluvial plains	NOC	-
11.3.25	*Eucalyptus tereticornis* or *E. camaldulensis* woodland fringing drainage lines	NOC	-
11.3.21	*Dichanthium sericeum* and/or *Astrebla* spp. grassland on alluvial plains. Cracking clay soils	E	E
11.4.3	*Acacia harpophylla* and/or *Casuarina cristata* shrubby open forest on Cainozoic clay plains	E	E
11.4.8	*Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains	E	-
11.4.9	*Acacia harpophylla* shrubby open forest to woodland with *Terminalia oblongata* on Cainozoic clay plains	E	E
11.5.1	*Eucalyptus crebra, Callitris glaucophylla, Angophora leiocarpa, Allocasuarina luehmannii* woodland on Cainozoic sand plains/remnant surfaces	NOC	-
11.5.2	*Eucalyptus crebra, Corymbia* spp., with *E. moluccana* on lower slopes of Cainozoic sand plains/remnant surfaces	NOC	-
11.5.3	*Eucalyptus populnea* and/or *E. melanophloia* and/or *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces	NOC	-
11.5.9	*Eucalyptus crebra* and other *Eucalyptus* spp. and *Corymbia* spp. woodland on Cainozoic sand plains/remnant surfaces. Plateaus and broad crests	NOC	-
11.5.16	*Acacia harpophylla* and/or *Casuarina cristata* open forest in depressions on Cainozoic sand plains/remnant surfaces	E	E
11.7.1	*Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana* or *E. microcarpa* woodland on lower scarp slopes on Cainozoic lateritic duricrust	NOC	-
11.7.2	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone	NOC	-
11.8.5	*Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks	NOC	

[17] These descriptions conform to the original circumscription of the respective regional ecosystem by Young and Dillewaard (1999) in Sattler and Williams (1999) and as contained in (REDD Version 4.2, 2005) http://www.epa.qld.gov.au/projects/redd/i .

		Conservation Status	
11.8.11	*Dichanthium sericeum* grassland on Cainozoic igneous rocks	OC	E
11.9.1	*Acacia harpophylla-Eucalyptus cambageana* open forest to woodland on Cainozoic fine-grained sedimentary rocks	E	E
11.9.4	Semi-evergreen vine thicket on Cainozoic fine grained sedimentary rocks	E	E
11.9.5	*Acacia harpophylla* and/or *Casuarina cristata* open forest on Cainozoic fine-grained sedimentary rocks	E	E
11.9.9	*Eucalyptus crebra* woodland on Cainozoic fine-grained sedimentary rocks	NOC	-

E – Endangered; OC – Of Concern; NOC – Not of Concern

As shown in Figure 4-16, the preferred alignment will pass through four Endangered REs (11.3.1, 11.3.21, 11.4.8 and 11.4.6) and two Of Concern REs (11.3.2 and 11.8.11) as listed under the VMA 1999.

A comparison of the certified RE mapping with the ground truthed mapping was undertaken to outline the differences in the mapping. The main differences are highlighted in the table below.

Table 13 Difference between certified and ground truthed RE Mapping

Certified RE Mapping	Ground truthed RE Mapping
The certified RE mapping shows that the preferred alignment will impact on three Endangered REs (11.4.9, 11.8.13, 11.4.8) and four Of Concern REs (11.3.4, 11.8.11, 11.9.10 and 11.3.2.	The ground RE mapping shows the preferred alignment will pass through four Endangered REs (11.3.1, 11.3.21, 11.4.8 and 11.4.6) and two Of Concern REs (11.3.2 and 11.8.11).
Does not map the majority of the waterways within the study area as the endangered RE 11.3.1.	
The escarpment areas in the southern section of the project area (Denham Park) are mapped incorrectly as the Endangered RE 11.8.13.	These escarpment areas support the Not of Concern REs 11.5.3 and 11.5.1.
Not all areas of the Endangered Brigalow REs (11.3.1, 11.4.8, 11.4.9, 11.5.16, 11.7.1, 11.9.1 and 11.9.5) were mapped.	
Mapping areas on non-remnant vegetation as REs	
Mapping Suttor Creek as the Of Concern RE 11.3.2.	Suttor Creek supports the Not of Concern RE 11.3.25.
The eucalypt woodlands immediately north of Suttor Creek are mapped as the Not of Concern RE 11.9.9.	Areas to the north of Suttor Creek support the Not of Concern REs 11.5.3 and 11.5.1
Ridgelines in the central section of the project area (North Suttor Station) mapped as the Not of Concern 11.8.3.	Ridgelines in the central section of the project area (North Suttor Station) support the Not of Concern REs 11.5.3 and 11.5.1.

Certified RE Mapping	Ground truthed RE Mapping
Incorrectly mapping the regional ecosystems within the Leichhardt Range.	The vegetation in the Leichhardt Range supports the Not of Concern RE 11.7.2 and 11.3.10 and the Endangered REs 11.9.4, 11.9.5 and 11.3.1.
Incorrectly mapping out the regional ecosystems in the north of the project area beyond the Leichhardt Range.	The regional ecosystems in the north of the project area beyond the Leichhardt Range support the threatened Bluegrass communities including the Not of Concern RE 11.8.5, Of Concern RE 11.8.11 and Endangered RE 11.3.21.

Endangered RE 11.3.1 on ephemeral waterway

Of Concern RE 11.3.2 adjacent to Suttor Creek

Endangered RE 11.4.8

Endangered 11.9.5 within Leichhardt Range

Not of Concern RE 11.9.9

Not of Concern RE 11.8.5 and the Of Concern RE 11.8.11

Figure 4-17 Photos of Regional Ecosystems along the Rail Corridor (photos M. Olsen)

Endangered RE 11.3.21 along ephemeral waterway with a mosaic of the Not Of Concern RE 11.8.5 and the Of Concern RE 11.8.11 behind (habitat of *Dichanthium queenslandicum*).

Cleared lands within corridor with Not of Concern RE 11.5.3 abutting alignment

Not of Concern RE 11.3.25 on Suttor Creek

Endangered 11.5.16

Endangered RE 11.4.3

Endangered RE 11.4.9

Figure 4-18 Photos of Regional Ecosystems along Rail Corridor (photos M. Olsen)

Threatened Ecological Communities

Three endangered ecological communities listed under the EPBC Act 1999 are located within or adjacent to the rail alignment. These communities and their locations within the project area are described below:

Brigalow (*Acacia harpophylla* dominant and co-dominant)

Communities of remnant Brigalow (*Acacia harpophylla*) are found in a number of locations across the study site and include the following REs: 11.3.1, 11.4.3, 11.4.8, 11.4.9, 11.9.5, 11.9.1 and 11.5.16. This community is listed as an Endangered Ecological Community under the EPBC Act 1999 as a result of a severe decline to approximately 10% of its national area[18]. The Endangered RE 11.3.1(Brigalow) was found along some of the ephemeral waterways. Some of the vegetation on the rocky substrates conformed to the Endangered RE 11.9.1 (Brigalow) whilst the remaining patches of Brigalow were observed on the gilgaied clay plains (REs 11.4.3, 11.4.8 and 11.4.9). These gilgaied plains provided suitable habitat for the threatened EPBC listed Ornamental Snake (refer to Section 4.4.2.1).

The preferred rail alignment will disturb small patches of this threatened community.

Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South)

The black soil plains and undulating downs found in the far northern sections of the alignment supports the Bluegrass grassland RE 11.8.11. This RE is included in the description for the EPBC listing of the endangered ecological community: Bluegrass (*Dichanthium* spp.) dominant grasslands of the Brigalow Belt Bioregions (North and South). Cattle grazing presently occurs within this community.

The vulnerable listed grass *Dichanthium queenslandicum* (King Bluegrass) was observed within this community (refer below).

The preferred rail alignment will traverse areas of this community.

Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions

Semi-evergreen vine thickets are widely scattered and have a common structure, however they have considerable regional variation in floristic associations (DEH 2005). Within the Brigalow Belt Bioregions, semi-evergreen vine thickets have been fragmented, reduced in area and degraded through land clearing and agricultural/grazing practices.

Within the project area remnant stands of semi-evergreen vine thickets are assocaited with RE 11.9.4 and found on the rocky slopes and escarpments of the Leichhardt Ranges. Small patches of non-remnant and disturbed patches are located on the various escarpments found through the grazing lands within the study area.

The rail corridor will not impact on remnant stands of this community.

Flora

A list of flora observed during site assessments is provided in Appendix F. One threatened species was observed within the northern section of the study area: *Dichanthium queenslandicum* (King Bluegrass) (refer to photo below). This species is listed as vulnerable under the EPBC Act 1999 and vulnerable under the *Nature Conservation Act* 1992. This species is endemic to Queensland where it occurs mostly

[18] Of an estimated original extent of 7,324,560 hectares (7,020,360 ha in Queensland and 304,200 ha in New South Wales) approximately 804,264 hectares (661,314 ha in Queensland and 142,950 ha in New South Wales) remains (DEH website http://www.deh.gov.au/biodiversity/threatened/communities/brigalow.html, 31/10/05).

on black clay soils that support Bluegrass communities. This species flowers from November to January and is a valuable fodder species.

The species was observed at two locations within the Bluegrass communities (RE 11.8.11 and RE 11.3.21) found in the northern section of the rail corridor. Figure 4-19 maps the habitat of this species within the rail corridor and surrounds. At the two locations the species was observed at a density of 7-15 plants in a 25 m x 25 m quadrat. It should be noted that the entire corridor within suitable habitat areas was not traversed to locate all individuals.

Photo of inflorescence of the vulnerable *Dichanthium queenslandicum* located within rail corridor.

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Figure 4-19 Location of *Dichanthium queenslandicum*

Weeds

Four weeds declared under the *Land Protection (Pest and Stock Route Management)* Act 2002 are located within the study area, namely *Opuntia stricta* (Prickly pear), *Opuntia tomentose* (Prickly pear), *Eriocereus martinii* (Harrisia cactus) and *Parthenium hysterophorus* (Parthenium). All these weeds are Class two declared weeds and therefore under the Act landowners must take reasonable steps to keep their land free of Class 2 pests. In addition, Parthenium is also declared as a weed of national significance.

At the time of the survey, Parthenium was germinating and was abundant in cleared or disturbed communities however was less common in areas of remnant vegetation.

The invasive grass *Cenchrus ciliaris* (Buffel Grass) dominates the ground layer of many of the vegetation communities within the study area. This grass has been distributed extensively across the cattle grazing country of Australia.

4.4.1.2 Potential Impacts

General

A description of the existing vegetation communities and flora species within the project area is provided above. The alignment crosses through a predominately cleared landscape, however there are substantial tracts of remnant vegetation in some areas (mainly on the escarpments and undulating sedimentary landscapes due to their rocky, infertile nature and the poor water holding capacity of their thin veneer soils). Elsewhere the alluvium, clay plains, loamy/sandy plains and basalt plains/hills have been extensively cleared. This is particularly the case for the more fertile clay soils of land zones 4 (clay plains) and 8 (basalt black soil). Hence, many of the regional ecosystems on land zones 4 and 8 or those on other substrates with Brigalow (*Acacia harpophylla*) (e.g. 11.5.16 and 11.9.1) are classified as endangered under the VMA 1999 as a consequence of historical high rates of land clearance.

All the vegetation communities within the project area are subject to cattle grazing and in places are highly impacted from this activity. The construction and operation of the rail corridor will involve the removal of some vegetation but given the level of previous and current disturbance regimes will not adversely affect the long-term viability of any of the vegetation communities in the area.

Vegetation Clearing

Table 14 shows the estimated area of each RE that will be cleared as a result of the construction and operation of the rail line.

Table 14 Area of Regional Ecosystems to be cleared[19]

Regional Ecosystem	Area to be cleared (ha)
Endangered	
11.3.1	16.20
11.3.21	2.95

[19] This is based on the ground truthed regional ecosystems and not the certified mapping and a 60 m cleared corridor. Where possible it has been recommended that clearing be minimised in areas of remnant vegetation.

Regional Ecosystem	Area to be cleared (ha)
11.4.8	3.42
11.4.9	5.99
TOTAL	28.56
Of Concern	
11.8.11	14.52
11.3.2	2.02
TOTAL	16.54
Not of Concern	
11.5.1/11.5.3	39.97
11.7.2	9.31
11.8.5	12.64
TOTAL	61.92
TOTAL TO BE CLEARED	**107.02**

The preferred alignment may require the removal of up to 107.02 ha of remnant vegetation, including clearing of 28.56 ha of Endangered REs and 16.54 ha of Of Concern REs. In addition 25.61 ha of the EPBC listed Brigalow community and 17.47 ha the Bluegrass community will be cleared. This area to be cleared is based upon a worst case scenario that the entire 60 m wide corridor would be cleared for rail line construction. However the clearing of remnant vegetation will to be restricted to the minimum necessary to enable the safe construction, operation and maintenance of the railway line and associated infrastructure footprint including firebreaks, access tracks and construction haul roads (i.e. not involve clearing the entire 60 m wide corridor).

The clearing of vegetation for the construction of the rail corridor will result in the following potential impacts:

- Loss and fragmentation of endangered and of concern regional ecosystems;
- Loss of threatened ecological communities listed under the EPBC Act 1999;
- Loss of riparian vegetation at each of the waterway crossings;
- Spread and introduction of weed seeds/propagules on machinery and materials to the properties that the rail corridor crosses;
- Potential weed establishment within the rail corridor and surrounding properties through slashing, grading and soil disturbance from earth works; and
- Loss of individuals and habitat for vulnerable flora *Dichanthium queenslandicum* (King bluegrass) (refer below).

Given that the rail corridor will require clearing of mapped regional ecosystems a Clearing Permit for On-going Purposes is required under the VMA 1999 prior to construction occurring.

The most significant impacts associated with the operation of the rail line are:

» An increased incidence of fire along the proposed route. Too frequent fires, or burning at the wrong time, may have serious consequences for fodder availability and pasture composition, leading to a rapid increase in unpalatable grasses and woody and annual weeds such as Parthenium; and

» The introduction of new weeds to the site, being brought in on machinery, footwear and vehicles.

Threatened Flora

The vulnerable listed *Dichanthium queenslandicum* (King Bluegrass) is located within the rail corridor in the Bluegrass grasslands north of Leichhardt Range. The habitat of this species is continuously grazed by cattle and is degraded in areas. The rail corridor will impact on approximately 17.47 ha of potential habitat for this species. The loss of this habitat is not considered a significant impact to this species given the large area of habitat remaining and the present level of disturbance imposed by cattle grazing. Measures to minimise the impacts of the rail corridor on this species are provided below and in Section 5.8.1.4.

Weeds

The presence of weeds within the project area has been discussed above. Currently there are populations of four declared weeds, including the nationally declared weed Parthenium.

Weed invasion is one of the most important issues with respect to the flora of the study area. Weed infestations are enhanced by construction and maintenance activities that disturb and expose soil. The movement of vehicles and personnel along the alignment during construction of the rail line increases the potential for the movement and transfer of weed species from one location to another.

Provided care is taken in the use of earthmoving equipment to minimise soil disturbance and implementation of a Weed Management Plan (WMP) as outlined in the EMP (Section 5.8.1), weed spread and infestation along the rail corridor should be minimised.

For the operational life of the proposed project, a WMP should be prepared and implemented during all maintenance activities. This will assist in preventing the spread of declared and environmental weeds along the route.

4.4.1.3 Mitigation Measures

QR is willing to undertake the following mitigation measures during the construction and operational/maintenance phases of the project to minimise the impact of the rail corridor on terrestrial vegetation and flora.

Management Commitments
Pre- Construction
10. Prior to clearing, collection of seeds from local native trees for propagation and use in seed mixes, in particular the seeds of the vulnerable *Dichanthium queenslandicum.*
11. Clearing of remnant vegetation is to be restricted to the minimum necessary to enable the safe construction, operation and maintenance of the railway line and associated infrastructure footprint including firebreaks, access tracks and construction haul roads (i.e. not involve clearing the entire 60 m wide corridor).

Management Commitments
12. All vegetation to be removed is clearly marked and clearing contractors briefed on clearing requirements. In particular where the rail corridor crosses through Brigalow communities, contractors are to be made aware of the importance of the vegetation and ensure they do not accidentally or otherwise encroach on surrounding vegetation.
13. Construction sites, such as site office, soil stockpiles, machinery/equipment storage and construction camp are to be located within existing cleared areas or disturbed areas. There is to be no placement of construction sites in the Bluegrass grasslands (RE 11.8.11) in the northern section of the corridor. This vegetation community has a naturally minimal tree cover and is easily viewed as non-remnant vegetation.
14. Preparation of a construction specific Weed Management Plan (WMP), including a Parthenium Weed Management Strategy. Recommendations to control Parthenium weed is provided on the DNRM web site: (http://www.nrm.qld.gov.au/pests/weeds/declared_plants/parthenium.html). WMP to include details of vehicle wash down bays, vehicle signage and training.
Construction/Rehabilitation
15. Disturbed areas in environmentally sensitive locations, such as creek banks, steep slopes, dispersive/erodable soils are to be replanted with tube stock after construction activities have finished after construction activities have finished.
16. Construction areas will be appropriately treated to allow quick rehabilitation and returned to original state (i.e. cleared areas to be returned to conditions suitable for cattle grazing, vegetated areas to be planted with native species indigenous to the area and ecosystems).
17. Seeds of the vulnerable *Dichanthium queenslandicum* (King bluegrass) will be replanted into suitable habitat in the north of the corridor.
18. Where possible cleared vegetation is to be mulched and used in rehabilitation activities, the remaining vegetation is to be burned in a controlled manner to reduce the fuel load and fire potential along the corridor.
19. Implementation of the construction WMP.
20. Large hollow bearing trees that have been cleared are to remain intact after clearing. These trees are to be used in rehabilitation activities and placed in important habitat areas (such as under the Suttor Creek bridge) to provide fauna habitat.
Operation/Maintenance
21. Maintenance WMP is to be prepared and implemented for rail corridor. This is to be in accordance with requirements outlined in the EMP and standard QR procedures currently in region.
22. Maintenance contractors are to remain on the designated maintenance track and do not disturb surrounding vegetation.
23. Avoid disturbing habitat areas re-planted with *Dichanthium queenslandicum* during maintenance works.

4.4.2 Terrestrial Fauna

A fauna survey has been previously completed for the rail corridor in July 2005 (Maunsell 2005f). Information from this report has been incorporated into this section. Specialist fauna sub-consultants, Ecoserve undertook a detailed habitat assessment for the Ornamental Snake along the corridor, findings from this report is summarized below and provided in Appendix G.

4.4.2.1 Description of Environmental Values

Database Searches and Field Observations

Database searches of the EPA WildNet database, Queensland Museum Database and the EPBC online database were undertaken for the project area between latitude: -21.708975 and -21.131532 and longitude: 147.781262 and 147.998663. The EPA Wildnet and Queensland Museum databases lists wildlife previously recorded within the search area. The EPBC online search gives details of species that are likely to occur within the area based on bioclimatic modelling, as such, these species have not necessarily been observed within the search area.

A total of 317 species have been previously recorded within the search area, of these three have conservation significance. A search of the EPBC online database revealed a further 13 species of conservation significance that may either potentially occur in the area or have suitable habitat within the area searched.

A total of 121 vertebrate species, listed as common wildlife under the NCA 1992, were observed during field surveys (Maunsell 2005f). These comprised one frog, 24 reptiles, 77 birds and 21 mammals. These are listed in Appendix G. Three threatened species were observed during field surveys these are discussed below.

Threatened Fauna

Nine threatened species have been previously recorded, observed or potential habitat occurs within the study area. One species, the Squatter Pigeon (*Geophaps scripta scripta*) has been observed along the alignment and three species, Ornamental Snake (*Denisonia maculata*), Cotton Pygmy Goose *Nettapus coromandelianus*) and Black-necked Stork (*Ephippiorhynchus asiaticus*) have been observed within the general area. The remaining five species have not been observed within the area. Suitable habitat is found within the project area for the Ornamental Snake and a detailed habitat assessment for this species was completed as part of the EIS and the results provided below. Table 15 lists these threaten species and describes their preferred habitat and their potential to occur within the study area.

Squatter Pigeon observed along corridor.

An adult Ornamental Snake (Moranbah district) (Photo taken by A. Veary).

Figure 4-20 Threatened fauna observed or previously recorded within the Project Area

Table 15 Significant and migratory fauna previously recorded, observed or potential habitat occurs within Project Area

Class	*Scientific Name*	Common Name	Status		Preferred habitat/observations	Potential to occur within project area
			NCA	EPBC		
Birds	*Apus pacificus*	Fork-tailed Swift	C	M	Low to very high airspace over varied habitat from rainforest to semi-desert.	Yes
Birds	*Ardea alba*	Great Egret	C	M	Wetlands, flooded pastures, dams, estuarine mudflats, mangroves and reefs, shallows of rivers, swamps, large dams	Yes
Birds	*Ardea ibis*	Cattle Egret	C	M	Moist pastures with tall grass, floodplains, swamps, fodder crops	Yes
Birds	*Erythrotriorchis radiatus*	Red Goshawk	R	V	Tree-lined watercourses, surrounding open country, lightly wooded foothills. Nests in trees taller than 20m within one kilometre of permanent watercourse or wetland.	Unlikely
Birds	*Gallinago hardwickii*	Latham's snipe	C	M	Nests in northern Japan and gather in large numbers on the shores of local lakes, which function as a staging ground for their migration to Australia. Unlike most migratory birds, this species is solitary whilst in Australia.	Unlikely, preferred habitat does not occur along the proposed rail corridor

Class	*Scientific Name*	Common Name	Status		Preferred habitat/observations	Potential to occur within project area
			NCA	EPBC		
					Individuals prefer wet, treeless tussocky grasslands.	
Birds	*Falco cenchroides*	Nankeen kestrel	C	M	Suitable habitat	Observed in study area
Birds	*Geophaps scripta scripta*	Squatter Pigeon	V	V	Dry eucalypt woodlands and open grassy plains, well-drained river flats, open grassed woodlands and foothills, dry watercourses. Regionally nomadic following food sources. Preferred habitat for this species occurs as patches throughout the corridor. Can breed throughout most of the year.	Individuals observed within corridor, refer below for more details.
Birds	*Hirunda rustica*	Barn Swallow	C	M	Migrates from eastern Asia to Australia each summer. Forages in all types of woodlands and forests, avoiding only thick forests. Spend most of their time on the wing.	Yes
Birds	*Hirundapus caudacutus*	White-throated Needletail	C	M	Aerial species, feeding and drinking on the wing. Feed on insects from a few cm above the ground to well over 100 m. They sleep during the night by either clinging upright to foliage in forested areas or on the wing in communal rafts.	Yes
Birds	*Monarcha melanopsis*	Black-faced Monarch	C	M	Common in rainforest and wet forests along the east coast of	Unlikely, suitable habitat does not occur along the proposed rail

Class	*Scientific Name*	Common Name	Status		Preferred habitat/observations	Potential to occur within project area
			NCA	EPBC		
					Australia	corridor.
Birds	*Merops ornatus*	Rainbow bee-eater	C	M	Open country, sand ridges, river banks, road cuttings	Yes
Birds	*Myiagra cyanoleuca*	Satin Flycatcher	C	M	Breeds and forages within the wetter eucalypt forests of eastern Australia. After fledging the parents and young move to forage in the drier and more open forests. This is a highly mobile species.	Unlikely, preferred habitat does not occur along the proposed rail corridor.
Birds	*Numenius minutus*	Little Curlew	C	M	Breeds in Siberia and Mongolia, arriving in Australia in the summer months of September to October. On reaching Australia they fan out in flocks of thousands around the northern Australian coast, not along the beaches, but on bare, dry subcoastal plains, and even in airfields and suburban lawns.	Unlikely, preferred habitat does not occur along the proposed rail corridor.
Birds	*Neochmia ruficauda ruficauda*	Star Finch (eastern)	E	E	Grassy woodlands, water courses and swamps with rank grass, bushes, and low trees, highly susceptible to grazing pressure and has all but disappeared from areas where rainfall is unreliable.	Unlikely due to grazed and disturbed nature of entire proposed route.
Birds	*Nettapus coromandelianus*	Cotton Pygmy Goose	R	M	Completely aquatic, seldom leaving the water except to rest on logs. Spend the majority of their time floating among water lilies in	Observed in a farm dam on the Glenden Road to the east of the corridor. The project will not impact upon any suitable habitat for this

Class	*Scientific Name*	Common Name	Status		Preferred habitat/observations	Potential to occur within project area
			NCA	EPBC		
					deep water in pairs or small family groups. Come near to the shore only to feed. This species can move considerable distances.	species.
Birds	*Poephila cincta cincta*	Black-throated Finch (southern)	C	E	The southern subspecies occupies grassy woodlands dominated by eucalypts, paperbarks or acacias, where it has access to seeding grasses and water. Relatively sedentary near water courses and swamps with rank grass.	Unlikely due to grazed and disturbed nature of entire proposed route.
Birds	*Rostratula australis*	Australian Painted snipe[20]	V	V, M	Boggy swamps, active mostly at dawn and dusk.	Unlikely, preferred habitat does not occur along the proposed rail corridor.
Birds	*Ephippiorhynchus asiaticus*	Black-necked stork	R	M	Preferred habitat includes tropical to warm temperate wetlands, billabongs and estuaries. In arid regions are found in artificial water bodies such as farm dams, windmill supplies and sewage ponds (Marchant and Higgins 1990).	Observed on in water body in Isaac River within Goonyella mine site, immediately south of the preferred alignment. The project will not impact upon any suitable habitat for this species.
Reptiles	*Denisonia maculata*	Ornamental snake	V	V	Suitable habitat within project area (refer below).	Numerous previous sightings in surrounding area including Lancewood homestead and

[20] *Rostratula australis* is also known as *Rostratula benghalensis* australis and *Rostratula benghalensis* s. *lat.*

Class	*Scientific Name*	Common Name	Status		Preferred habitat/observations	Potential to occur within project area
			NCA	EPBC		
						Newlands Mine (EPA 2005). Potential to occur within refer below for more details.
Reptiles	*Egernia rugosa*	Yakka Skink	V	E	Prefers a warm tropical or sub-tropical climate. Prefers open, dry sclerophyll forest or woodland with dense ground vegetation, fallen timber and other debris.	Yes, if present the rail corridor is not considered to significantly impact this species.
Mammals	*Dasyurus hallucatus*	Northern Quoll	C	E	Wide variety of habitats, preferred broken rocky country and open eucalypt forests within 150 km of the coast (Strahan 1995).	Potential habitat within the study area. Due to the large home range of this species, any loss of habitat as a result of the project is considered to be minimal.
Mammals	*Nyctophilus timoriensis*	Eastern Long-eared Bat	C	E	Tall eucalypt forest, mallee, open savannah and Black box woodland. They prefer semi-arid areas (Churchill 1998.	Suitable habitat within study area. Due to the prevalence of surrounding suitable habitat the project is considered to have minimal impacts on this species.

NCA Status - Indicates the conservation status of each taxon under the Nature Conservation Act 1992.
C = Common
V = Vulnerable
R = Rare
EPBC status: Indicates the conservation status of each taxon under Environment Protection and Biodiversity Conservation Act 1999.
M = Migratory
V = Vulnerable
E = Endangered

Ornamental Snake (*Denisonia maculata)*

Specialist ecologists Ecoserve Pty Ltd undertook a detailed habitat assessment for the Ornamental Snake. A summary of this report is provided below and the full document in Appendix G.

Ecology and Biology

The Ornamental Snake *Denisonia maculata* is listed as Vulnerable under the NCA 1992 and EPBC Act 1999. It is only found located within mid-eastern Queensland and is restricted to the Brigalow Belt, primarily within the Fitzroy and Burdekin basins.

The biology of the Ornamental Snake is poorly known. Currently it is known to inhabitant seasonally inundated habitats, especially gilgai landscapes within Brigalow, with deep cracking clay soils (Figure 4-21). The Ornamental Snake is a specialist frog predator. The highest recorded levels of activity occur immediately after summer rainfall events, which create optimum conditions for its favoured frog prey. This limits the opportunity to detect this species to the wetter and warmer summer months.

Known threatening process for this species include:

- overgrazing;
- habitat alteration/clearing for agriculture;
- pastoral improvements;
- urban development; and
- possible poisoning by Cane Toad ingestion.

Quality habitat where Ornamental Snakes have previously been recorded (Moranbah district) (photo by A. Veary).

An area within the rail corridor which is representative of the heavily degraded habitat (*Acacia harpophylla* on cracking clays with gilgai development) which may have previously represented suitable habitat for Ornamental Snake (photo by A. Veary).

Figure 4-21 Photos of Habitat for the Ornamental Snake

Ornamental Snake Habitat within the Study Area

Potential habitat occurs in the project area with the presence of gilgai and deep cracking clays, however these features do not necessarily comprise quality habitat (Veary and Lindsay 2005). The corridor traverses a number of areas that support gilgai soils, however the majority of these areas have been cleared of woody cover (*Acacia harpophylla*), fallen timber and leaf litter. These ground features are important in maintaining soil moisture and thermal conditions, all of which are considered important habitat requirements for invertebrates and this in turn on the diversity and abundance of frogs which feed on them and then in turn on the snakes. These features also are considered important refuge for the snake during drier conditions.

It is considered that prior to European settlement the region would have been likely to support good quality habitat for the Ornamental Snake. However, given the high level of cattle grazing within the project area and the associated disturbances, much of the region only supports marginal and poorer quality habitat for this species.

The location of habitat areas for the Ornamental Snake within the project area is provided in Figure 4-22. This figures illustrates that the rail corridor will transact large areas of possible habitat. To minimise fragmentation of habitat the following measures are provided:

» Inclusion of culverts to allow uninterrupted surface flows across gilgai landscape;

» Design of culverts to provide an area with dry passage to allow access of small fauna (such as frogs and snakes) under the rail corridor.

The use of the culverts by Ornamental Snakes is unknown, but other snake species are known use such structures, such as under roads.

Provided these measures are implemented the project is not considered to significantly impact on the Ornamental Snake[21].

[21] As defined in the EPBC Act 1999

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Figure 4-22 Habitat for Ornamental Snake within Project Area

Squatter Pigeon (*Geophaps scripta* var. *scripta)*

The Squatter Pigeon (*Geophaps scripta* var. *scripta*) is the only threatened species recorded along the proposed alignment. This species is listed as 'Vulnerable' under the NCA 1992 and the EPBC Act 1999. This species appears to prefer sandy soils and dissected low gravely ridges which have a short and open cover of grasses. It is less common on heavier soils with a dense growth of grasses, and rarely occurs on bare plains sparsely vegetated with grasses and shrubs. It will occasionally utilise sown grasslands and pastures, especially with a few trees and is nearly always found near permanent water (Higgins and Davies 1996).

During the field visits, a number of birds were observed in Eucalypt woodlands in both the northern and southern sections of the corridor (Byerwen Station and Denham Park).

In Queensland, much of the pigeon's original habitat has been planted to pasture grass for cattle. While this has led to a decrease in the abundance of natural food source, the grazing effects of cattle are not as destructive as those of sheep, and improved pastures are possibly an important source of food (Higgins and Davies 1996).

Threats to the Squatter Pigeon in the vicinity of the corridor are considered to include:

» Competition for grasses from introduced herbivores;

» Predation by feral cats and to a lesser extent foxes; and

» Loss of preferred riparian habitats through trampling, overgrazing by stock and clearing.

Given the abundance of available habitat within the area, the project is not considered to have a significant impact to this species. No specific management measures are provided.

Migratory Species

Fourteen migratory species occur or suitable habitat occurs within the study area. A number of migratory species were observed within the general study area, including Black-necked Stork (*Ephippiorhynchus asiaticus)*, Cotton Pygmy Goose (*Nettapu coromandelianus*) and Nankeen Kestrel (*Falco cenchroides)*. The former two species were observed at artificial water bodies (dams, stream diversions) surrounding the study area.

Table 15 lists these species and describes their preferred habitat and their potential to occur within the study area.

Introduced Species

Six introduced species, namely the Cane Toad (*Bufo marinus*), Rabbit (*Oryctolagus cuniculus*), Cat (*Felis catus*), Pig (*Sus scrofa*), Fallow Deer (*Dama dama*) and Dingo (*Canis lupis dingo*) were observed along the alignment.

Habitat Values

The proposed rail corridor passes through patches of disturbed/cleared and remnant vegetation (Figure 4-16) and hence a variety of habitats. All the remnant vegetation crossed by the proposed route has been degraded to a greater or lesser extent by cattle grazing. The clearing of

native vegetation and presence of cattle grazing has resulted in substantial alterations and simplification of faunal habitats and structure throughout the project area. This is evident throughout the corridor, especially within the clay plains. Only the less fertile rocky rises and tablelands support larger intact stands of remnant and regrowth vegetation. A consequence of cattle grazing is a more open ground cover with limited recruitment of shrubs or trees. This impacts on the habitat and refuge available for smaller fauna such as lizards, birds and mammals.

The decline in habitat values associated with cattle grazing is likely to have affected all faunal groups and consequently the area is likely to only support a low diversity of native taxa. The majority of these species will be common and widespread.

Isolated patches of remnant vegetation and watercourses harbour important fauna habitats features such as hollow-bearing trees, stags and fallen timber, riparian vegetation and rocky outcrops. Each of these areas provides habitat and refuge for fauna species within the largely degraded landscape. In particular the vegetation along Suttor Creek and Leichhardt Range provides significant continuous vegetated linkage across the project area.

4.4.2.2 Potential Impacts

The potential impacts of the rail corridor on terrestrial fauna and habitat within the project area are discussed below.

Fragmentation

Habitat fragmentation is the most obvious negative impact the construction of the rail corridor will have. Habitat fragmentation is a reduction in the continuity of a habitat through disturbance or loss. Impacts from habitat fragmentation can be as a result of either:

» Direct loss of vegetation through clearing, thus isolating patches of habitat; or

» Indirect impacts, including the potential for feral predators to penetrate further into bushland areas by using the newly constructed tracks and cleared corridors.

Specific issues relating to habitat fragmentation as a result of the proposed rail corridor include:

» Removal of mature vegetation and hollow-bearing trees and therefore loss of perching, foraging and den/nesting resources;

» Removal of mature vegetation in general reduces feeding and den/nesting resources for native species. It is recognised that the proposed loss of mature vegetation would not be great. However, it is necessary to implement management practices that further reduce the loss of vegetation associated with the proposed rail corridor.

» One of the most likely impacts is the loss of hollow-bearing trees. Such trees are a limited resource in many rural and grazed lands where clearing has removed much of the vegetation. The loss of tree hollows, and the extremely long time hollows take to form, is realised to be one of the major threats to Australia's biodiversity (Gibbons and Lindenmayer 2002). It is likely therefore that the preservation of these trees on the site would provide valuable resources and habitat for fauna.

- Disturbance to fauna movement corridors and dry season fauna refuges (predominantly associated with creeks and dams); and
- Physical barrier to fauna movement and a potential 'trap' provided by the rail line itself. The rail corridor will be a permeable barrier slowing or restricting the movement of fauna. Mobile species likely to cross the corridor unimpeded include birds, bats, ground dwelling mammals and amphibians. Given the extensive barbed-wire fencing already throughout the study area, the corridor is not expected to cause any major impacts on fauna movement.

Given the already substantially cleared and fragmented environment of the study area, the presence of the rail corridor is not considered a significant threat to the fauna within the area.

Edge Effects

Edge effects can include the establishment of weeds, alteration to micro-climatic conditions (such as greater light intensity, more wind penetration, lower humidity) and a reduction in plant health through loss of photosynthetic potential (as a result of plants being covered by dust generated from vehicle movement on unsealed tracks). In the absence of appropriate control measures, the project has the potential to cause impacts in relation to edge effects, and particularly in relation to the introduction and / or spread of weed species throughout the proposed rail corridor. Habitat alteration and degradation can result thus impacting upon those species that are habitat specialists.

Impact-related mortality is considered to be of minor consequence due to the lower expected number of trains movements compared to other land based transport modes (e.g. cars).

Threatened Species

The project is not considered to have a significant impact to threatened species within the study area. The mitigation measures recommended for the Ornamental Snake are considered sufficient to minimise impact to this species.

Migratory Species

The project is not considered to have a significant impact to any migratory species that inhabit or utilise the project area during their migration.

4.4.2.3 Mitigation Measures

The rail corridor is predominantly located in a cleared landscape, with small isolated patches of remnant vegetation located along ridgelines and along creeks. QR is committed to undertaking the following management actions to minimise impacts to fauna species and habitats.

Management Commitment
24. As far as practicable, mature and hollow bearing trees are to not be cleared along Suttor Creek after considering safety, operational and maintenance issues.
25. At each of the bridge crossings for Kennedy, Eaglefield and Suttor creeks, logs, boulders and small trees/shrubs should be retained under the bridges, where possible, to provide protection for fauna moving along these creeks.

Management Commitment
26. Provision of culverts within gilgaied landscaped to allow uninterrupted surface flows across landscape and allow small fauna such as frogs and snakes, especially the Ornamental Snake the ability to cross beneath the rail corridor.
27. Large tree to be cleared are to be checked for wildlife before clearing.
28. Trees with large raptor nests should not be cleared, where possible, after consideration of safety, operational and maintenance issues.

4.4.3 Aquatic Biology

4.4.3.1 Description of Environmental Values

There is limited information available on the aquatic ecology, including species diversity and numbers within the Belyando/Suttor Catchment (Roth *et al* 2002). Given the ephemeral nature of the waterways, surveying for aquatic flora and fauna is seasonally limited. At the time of the field survey, all waterways and wetland areas were dry and unable to be assessed.

A number of farm dams are present within the project area and these are likely to be providing habitat for small fish and crustaceans, such as the species in the photo below, as well as migratory and water birds (discussed above).

Freshwater crustacean found along an ephemeral waterway in the Leichhardt Range

4.4.3.2 Potential Impacts and Mitigation Measures

Potential impacts to the aquatic ecology within the project area will be minimal and include:

» Increased sedimentation and changes in water quality; and

» Changes in flow regime in vicinity of crossings.

The proposed project does not involve the construction of stream diversions and most of the construction works within waterway crossings are planned to be done during dry season. All bridge crossings have been designed in accordance with AS:5100 and are unlikely to cause

changes in the local hydrology and subsequent impacts to fish and aquatic invertebrate breeding requirements. Mitigation measures have been provided in Section 4.1.2 to minimise the potential of erosion and sedimentation of the local waterways.

Given the low rainfall volumes and the rural nature and low, widely spaced human population within the project area, potential increases in mosquito and biting midge breeding sites is expected be minimal and associated impacts minor. No strategies are proposed to control mosquito or biting midge breeding sites.

4.5 Historic and Cultural Heritage

QR has coordinated the cultural heritage assessment of the study area. This section provides a summary of the work undertaken by QR, in consultation with the respective traditional indigenous owners. The full reports of the cultural heritage studies undertaken for QR are not contained in this EIS in order to maintain the confidentiality of artefact and other significant cultural heritage sites. For more detailed information on cultural heritage sites of significance located in the region than is provided in this EIS, the respective traditional owners of the land concerned should be contacted. It should be noted that the Coordinator General's office has been provided copies of the reports in confidence to assist in the decision making process.

In the assessment, the values of the *Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (Burra Charter)* 1997 were followed. The Burra Charter is used as a guide to Australian cultural heritage management, covering both indigenous and non-indigenous heritage. The Burra Charter provides a basis for the management of cultural heritage values, items and places.

The objectives of the cultural heritage assessment was to provide a study of the cultural heritage within the region of the Northern Missing Link rail corridor, by way of:

- Literature reviews and desktop studies;
- Archaeological survey conducted in conjunction with traditional owners to identify culturally significant sites along the proposed alignments;
- Identification of potential impacts of project on culturally significant sites;
- Assessment of the probability of significant subsurface sites; and
- Providing recommendations to mitigate potential impacts.

It should be noted that only a 100 m wide area was surveyed along each of the proposed alignments and that the cultural heritage values located outside this 100 m wide corridor were not assessed.

Relevant Legislation

The following legislation is relevant to the protection of both Aboriginal and European cultural heritage:

- Aboriginal Cultural Heritage Act 2003;

- Queensland Heritage Act 1992;
- Environmental Protection and Biodiversity Conservation Act 1999; and
- Aboriginal and Torres Strait Islander Heritage Protection Act 1984.

4.5.1 Description of environmental values

The nominated route of the proposed rail link crosses land pertaining to three local indigenous groups – the Birri group, the Wiri (#2 and #3) groups and the Jangga group. The locations of these Native Title claims of these groups are provided in Figure 4-23.

A search of the Cultural Heritage Database and Register (DNRM) for significant indigenous cultural heritage sites revealed that up to 250 sites of cultural significance exist along the length of the proposed rail corridor, including scarred trees, stone hearth/artefact scatters, rock art sites, and stone quarries.

Systematic cultural heritage surveys of Native Title claim areas within the project area were undertaken by qualified archaeologists, in conjunction with representatives of the respective traditional owners and involved on-going consultation with these groups. Cultural heritage surveys of the proposed corridor involved the project archaeologist walking the corridor with field officers from the respective indigenous groups, to identify the presence and location of culturally significant sites within their Native Title claim and in relation to the proposed rail link route. Traditional owners were also consulted to establish an oral history of the region.

A summary of findings of the surveys and consultation of each of the Native Title claims is provided below.

Figure 4-23Native Title Claims within the Project Area

4.5.1.1 Birri Group

The Birri people traditionally inhabited the northern end of the proposed corridor, to the northwest of the region currently occupied by Glenden and the Newlands Mine. Previous archaeological studies undertaken for development projects in the region have revealed extensive use of the locality by the Birri people. High concentrations of artefacts have been discovered alongside waterways such as Cerito Creek, Suttor Creek and Boundary Creek, indicating these as previous areas of high use.

A field survey of the Birri sector of the proposed corridor revealed that a total of 23 cultural sites exist in the area. Of these sites, 13 stone artefact scatters were located along the preferred corridor and the northern alternative. Ten isolated artefact sites and one stand of significant vegetation site (food trees and significant old trees) are located along the preferred corridor. Surveys have shown that this section of the proposed corridor does not contain any sites of European cultural heritage.

The Birri people have indicated that the isolated artefact sites and stone artefact scatters located along the proposed rail corridor are of high cultural significance, as these sites provide a bond to the land. Sites containing vegetation of cultural value hold medium to high significance to the Birri people, as these sites contain traditional food trees and are of high conservation value in view of limited uncleared sites in their region. Scientific archaeological significance is low at the sites containing vegetation of cultural significance and isolated artefacts, however the sites with stone artefact scatters are of low to medium scientific archaeological significance, as collectively they add to the information on regional cultural heritage.

The Birri group has provided the following recommendations for the construction of the rail corridor, where possible these have been incorporated into a draft Cultural Heritage Management Plan (CHMP):

- Prior to construction activities commencing, representatives of the Birri Traditional Owners are to salvage isolated artefacts within the preferred alignment;
- Corridor width and vehicle tracks are to be minimised in the vicinity of watercourses containing stone artefact scatters;
- QR to take measures to avoid impacting identified cultural trees and vegetation during construction of the corridor;
- Implementation of a cultural monitoring program by QR, involving appointment of Birri representatives to monitor construction of the corridor within the Birri Native Title area;
- If monitoring identifies subsurface cultural heritage sites, QR will immediately cease work in that location until appropriate management strategies are made by Birri representatives; and
- If human remains are located during development of the corridor, QR will contact the Birri Traditional Owners and immediately cease work within 100m, until appropriate management strategies are made by Birri elders.

4.5.1.2 Wiri 2 Group

The Wiri 2 group occupy a 13 km length of the proposed rail link corridor. Wiri 2 field officers identified six sites within the proposed corridor, containing artefact scatters consisting primarily of flakes and scrapers. Three additional sites were located containing isolated finds.

The Wiri 2 group has provided the following recommendations for the construction of the rail corridor, where possible these have been incorporated in a draft CHMP.

» Implementation of a cultural monitoring program by QR, involving appointment of Wiri 2 representatives to monitor construction of the corridor within the Wiri 2 Native Title area;

» If monitoring identifies new or subsurface cultural heritage sites, QR will immediately cease work in that location until inspection by Wiri 2 traditional owners and/or archaeologist occurs;

» The site referred to as 'Native Well' is not to be impacted during construction and operation; and

» If human remains are located during development of the corridor, QR will contact the Wiri Traditional Owners and immediately cease work within 100m, until appropriate management strategies are made by Wiri 2 elders.

4.5.1.3 Wiri 3 Group

The Wiri 3 people have identified that a large portion of proposed corridor within their claim area is of no cultural significance, with the exception of a few sites located in the southern region. Wiri traditional owners assigned these sites as having a low level of cultural significance, however only visible sites were assessed and subsurface sites may exist.

A search of the Indigenous Sites Register and Database revealed that three artefact scatter sites (GH:F89, GH:F90 and GH:G07) were listed within the proposed corridor within the Wiri claim area, however archaeological field officers, were unable to locate two of the three sites (GH:F89, GH:G07). One site located on the western side of the Sunwater pipeline and within 20 m of GH:F90 was observed, however it remains inconclusive as to whether this is a new site or the actual location of GH:F90. Various other artefacts, including flakes and tool fragments were found in the Wiri 3 section of the rail corridor, primarily in the southern region.

The Wiri 3 group has provided the following recommendations for the construction of the rail corridor, where possible these have been incorporated a draft CHMP.

» Ongoing consultation with QR during the initial construction phase of the branch line to ensure the management of cultural heritage issues;

» Implementation of a monitoring program involving Wiri Corporation representatives, to monitor clearing and grading of the corridor to a depth of 50 cm in areas of grassland and to a depth of 1m within 100m of watercourses;

4.5.1.4 Jangga Group

The Jangga group occupy the region encompassing the southern and central 63 km of the preferred corridor. Consultation with the Jangga Traditional Owners began in April 2005 and

continues to the present time. Consultation has included meetings, written correspondence and the dissemination of route maps.

Along the section of the preferred route within the Jangga claim area, the Jangga representatives identified 124 culturally significant sites including isolated artefacts, stone scatters, fireplace and rock shelter locations, culturally significant trees, vegetation and natural features and ochre deposits. A number of large artefact scatters are located towards the north of the Jangga section of the corridor. Few artefacts were located in the southern section of the corridor. High concentrations of artefacts have been discovered alongside or at the junction of waterways in this region (especially Suttor Creek), indicating these as areas of high use. Of particular note is the ochre deposits in the region, these deposits are of fine quality and are of potentially very high significance. They point to the possibility of a trade in ochre and are also closely associated with ceremonial behaviour.

A total of 65 stone artefact scatter sites were identified, with artefacts consisting of flake waste and fragments, tools and grinding stones of varying materials. The majority of both these sites and isolated artefact sites, such as fireplace locations, scarred trees, rockshelters, natural features and other culturally significant sites were primarily located along the preferred alignment. A second survey was undertaken for an alternative route (Option C) in the southern section of the corridor (refer to Section 2.3.4) and this identified a number of additional sites of cultural significance, including significant trees, artefact scatters and isolated finds.

The Jangga people have indicated that the identified cultural sites in this region are of significance, as these sites provide a connection to traditions and heritage of the Jangga group. The sites are also of scientific archaeological significance as collectively they contain valuable information on regional cultural heritage, with the more extensive sites providing knowledge on implement use and daily activities.

The Jangga group has provided the following recommendations for the construction of the rail corridor, where possible these have been incorporated a draft CHMP.

- Implementation of a cultural monitoring program, involving appointment of Jangga representatives to monitor clearing and grading of the corridor, and overseeing of earthworks in proximity to isolated artefact and artefact scatter sites and watercourses within the Jangga Native Title area;
- Representatives of the Jangga Traditional Owners to perform salvage of all other artefacts within the proposed corridor prior to the construction of the rail corridor;
- QR to limit corridor width and vehicular routes in the vicinity watercourses containing stone artefact scatters;
- QR to avoid impacts to old growth vegetation and identified culturally significant trees and vegetation during development of the corridor;
- QR to use temporary barricading around identified culturally significant trees and vegetation within/immediately adjacent to rail corridor during development of the corridor;

- If monitoring identifies subsurface cultural heritage sites, QR will immediately cease work in that location until appropriate management strategies are made by Jangga representatives;
- If human remains are located during development of the corridor, QR will contact the Jangga Traditional Owners and immediately cease work within an agreed distance, until appropriate management strategies are made by Jangga elders;
- Construction activities should be limited to areas surveyed as part of this project should construction activities be required outside of designated areas, then a cultural heritage assessment should be conducted of these areas; and
- Personnel/contractors involved in the development of the corridor must attend a cultural heritage induction prior to development commencement.

4.5.1.5 Non-indigenous history

A search of the area surrounding the rail alignment did not locate any evidence of early European settlement along the preferred alignment.

4.5.2 Potential Impacts and Mitigation Measures

The preferred alignment has the potential to impact on a number of significant Aboriginal cultural heritage sites such rock shelters, ochre deposits, scarred trees and artefact scatters as it passes through the three Native Title area of the Birri, Wiri (2 and 3) and Jangga groups. In order to minimise the impact of the rail corridor on culture heritage sites, where possible the route has been aligned to avoid sites of high significance or sites unable to be moved or salvaged (such as scarred trees and rock shelters). Where sites will be disturbed, management measures such as salvaging or moving the sites have been provided. Draft CHMPs have been prepared in consultation with each of the Native Title groups to ensure that impacts to cultural heritage is minimised.

The project may also potentially impact on subsurface cultural heritage sites, which are unidentified by surface surveys. These sites may be impacted as a result of earthworks during the construction phase, measures and recommendations made by each of the Native Title claimants have been provided in draft CHMPs to manage these potential impacts.

Draft CHMPs that have been prepared in consultation with each of the Native Title groups are provided in Appendix H.

Management commitment
29. QR is committed to finalising each of the draft CHMPs with the three Native Title claimants and implementing the final CHMPs.

4.6 Social and Economic Environment

Overview

GHD have undertaken a Social and Economic Impact Assessment (SEIA) of the project area and surrounding area. A summary of the demographic profile and potential impacts identified by affected landowners and local councils is provided below. Detailed information is provided in Appendix I.

The objective of the SEIA is to anticipate and predict social and economic impacts from the NML project so findings and recommendations can become part of the project's planning and decision-making process. As part of the EIS process real and perceived impacts identified by the landowners have been taken into consideration and mitigation and management measures provided to minimise these impacts.

Methodology

The methodology for the SEIA included:

» A review of the local and regional study areas including general development (local history), population trends, economic drivers and environmental qualities;

» A comparative analysis of the social characteristics of the local, regional and state ABS 2001 Census statistics;

» Focused consultation with key informants from the local government councils to determine existing levels of demand on services and potential impacts associated with the proposed railway;

» One-on-one meetings with all directly affected landowners and shire council representatives between 26 and 30 September 2005; and

» Identification and consideration of potential mitigation measures to address the likely social and economic impacts.

4.6.1 Description of environmental values

4.6.1.1 Structure of affected communities

Local Community

The local community includes the directly affected property landowners, their associated families and/or farm employees and surrounding properties. The affected landowners include:

» Mr D. V & R. A Kemp of Denham Park Station;

» Bilyana Holding (E.P Mason) of Bilyana Station;

» Mr B & J Pini of Lancewood Station;

» Mr G & L Perry of Wollombi Station;

» Mr A and P Maddern of Suttor North Station; and

» Colinta Holdings Pty Ltd (a subsidiary of Xstrata) of Byerwen Station.

Information on land tenure and property size has been provided in Table 8.

Three of these landowner families have been in the region for 3 to 4 generations, with two families able to trace their history to the 1880's. *Behold Nebo: A History of the Nebo Shire* documents the writings of James Perry who was writing for Mackay's *Daily Mercury* in the 1940s when he was in his seventies (Mayes 1991). All of the landowners can trace their family history to the region for at least 2 generations, taking them back to the 1950's. This historical link to the properties and the region creates a strong sense of place for the landowners. They and their families before them have seen the development of the coal industry around their properties since the 1960's.

All properties within the immediate area surrounding the rail link are managed as beef cattle stations.

Regional Community

The regional community includes the towns and local government areas that are likely to be directly impacted on by the proposed railway. The local towns likely to be affected include:

» Glenden;

» Moranbah

» Nebo; and

» Collinsville.

Table 16 provides a brief history of these local centres. To a lesser extent the larger coastal centres of Mackay and Bowen will also be indirectly affected by the NML project. The rail corridor is located within three local government areas; namely Belyando Shire, Nebo Shire and Bowen Shire.

Table 16 Summary of Development History of Regional Towns Impacted by the Proposal

Town	Shire	History
Glenden	Nebo	This is a small town located approximately 40 km to the east of the proposed corridor. Mount Isa Mines (MIM) developed the town as part of their development of the Newlands Coal Mine in 1982. Glenden is an 'open town' so although the town and its facilities were built by MIM, the services and public facilities are administered by the Nebo Shire Council.
Moranbah	Belyando	The area around the current town of Moranbah was settled in the 1850s by pastoralists Andre Scott who called his cattle station *Moranbah*. The original township was built on the banks of the slow flowing Grosvenor Creek, and was named after the nearby Moranbah Station. According to Murray, A (1996:vii) "Moranbah is, first and foremost, a

Town	Shire	History
		mining town. It owes its existence and prosperity to coal. The schools, shops and services are there to serve the miners and their families." The majority of the miners living at Moranbah work at the BHP Australia Coal owned mine *Goonyella-Riverside*. Moranbah is located approximately 40 km south of the rail corridor.
Collinsville	Bowen	The Collinsville area was initially grazed, with the Strathmore Station established in 1861. During the 1880's several gold mines were operating in the area with reports of large coal deposited in 1865. The main township of Collinsville was named in 1921 when 20 homes were erected. The State-owned mines closed in 1961 and were reopened under private ownership in 1963. Today, Xstrata Coal owns the open cut mine with THEISS contractors being the main operators.[22]
Nebo	Nebo	According to Mayes (1991:1) the first European to pass through the area now known as Nebo Shire was Ludwig Leichhardt in 1845 naming many of the areas to the south and west of the Shire. In 1856 William Landsborough named most of the eastern area of the Shire. James Perry, an early historian wrote extensively for the Mackay *Daily Mercury* in the 1940s when he was aged into his seventies. In 1949 one of Perry's published articles refers to "*In the early 1860's there was a great movement of sheep and cattle from the Rockhampton area to the Bowen district, and stations were being set up on the Issac and Suttor Rivers.*" The town of Nebo was established to service this grazing industry is the oldest town in the region.

4.6.1.2 Community Profile

The following section provides an overview of the demographics of the local, regional and state study areas. Data was obtained using the Australian Bureau of Statistics CDATS 2001.

It should be noted that the Census statistics quoted in this Report is from 2001 and there has been a significant growth in the coal industry across the region since this time. Accordingly impacts as result of growth of the coal industry since 2001 (such as increase in employment, type and quantity of dwellings, age and workforce) will not be reflected in the statistics of this report.

Population and Age

Information on population and age within local and regional areas is provided in Table 17 and Table 18.

[22] Source: Bowen Shire Council *Bowen and Collinsville 2005/2006* pp. 50-51

Table 17 Population: Local, Regional and State (B01 2001)

	Local	Regional	State
Total Persons	1,586	26,110	3,655,139
Total Male	1,136	14,279	1,807,730
Total Female	450	11,831	1,847,409
Total 14 and under	263	4,252	762,542
Total 65 and over	198	2,887	450,900

Table 18 Age Distribution: Local, Regional and State (B03 2001)

	Local		Regional		State	
	M	F	M	F	M	F
0-14	140	123	2,953	2,705	391,611	371,531
15-24	131	55	1,654	1,340	251,126	244,109
25-44	492	172	4,464	3,549	512,009	534,013
45-64	279	105	3,611	2,696	419,819	418,916
65 and over	84	21	1,452	1,409	201,589	241,516
Total	**1,126**	**476**	**14,134**	**11,699**	**1,807,730**	**1,847,409**

Of the Queensland population, 0.125% live in the area defined as local in this report and only 0.714% of the Queensland population live in the area defined as regional in this report. Six percent of the regional population live in the area defined as local in this report. All population living in the area described as local live and work on beef cattle properties.

The local male to female population ratio is significantly different to the regional and state male for female population ratio. The local ratio is 72 males to 28 females, the regional ratio is 54:46 and the State ratio is 49:51.

Family Structure

Table 19 shows the breakdown of family structure at local and regional levels.

Table 19 Family Structure: Local, Regional and State (B17 2001)

	Local	Regional	State
Couple with children	127	3,003	417,806
Couple without	89	2,327	349,697

	Local	Regional	State
children			
One parent family	6	649	149,585
Other	3	61	16,567
Total Families	**225**	**12,080**	**933,928**

The local (57%)and state (45%) percentages for the family type “couple with children” were similar, however there was a significantly less representation of this type of family at the regional level, only 25%. This statistic is a result of the significant number of young men living in the towns of Moranbah and Glenden and working in the regional coalmines.

Of the directly affected properties, there are two families that have children of school age living on the property. Table 20 provides an indication of the number of people that live and work on the directly affected properties.

Table 20 Number of people affected on the properties directly impacted by the project

Property	Number of people directly affected
Denham Park	10
Bilyana	8
Lancewood	9
Wollombi	9
North Suttor	5
Byerwen	9
Total	**50**

Workforce characteristics

Table 21 provides an indication of the workforce breakdown within the local and regional areas.

Table 21 Industry Workforce: Local, Regional and State (B26 2001)

	Local	Regional	State
Agriculture, Forestry and Fishing	304	2,364	76,532
Mining	273	2,399	19,286
Manufacturing	24	457	167,380
Electricity, Gas and Water Supply	3	92	12,359

	Local	Regional	State
Construction	41	646	111,209
Wholesale Trade	25	590	79,718
Retail Trade	16	1,215	239,615
Accommodation, Cafes and Restaurants	38	544	88,381
Transport and Storage	94	611	77,587
Communication Services	0	78	23,016
Finance and Insurance	3	131	44,562
Property and Business Services	53	505	153,864
Government Administration and Defence	9	318	75,048
Education	12	660	118,896
Health and Community Services	9	617	151,029
Cultural and Recreational Services	9	81	37,341
Personal and Other Services	6	249	57,662
Non-classifiable economic units	0	40	7,452
Not Stated	18	207	27,927
Total	**937**	**11,804**	**1,568,864**

At the local and regional level the highest numbers of employment is in the Agricultural, forestry and fishing industry and the mining industry.

Based on interviews with Nebo Shire Council representatives and directly affected landowners, there is currently a trade and operator skills shortage in the region. Anecdotal evidence suggests that this is due to the higher wages being offered by the mines, which is attracting people from these trades. Also the high employment requirements of the mines are resulting in a shortage of young people able or willing to take up apprenticeships/qualifications in these trades.

Accommodation availability

Table 22 shows that type and quantity of accommodation available locally and regionally.

Table 22 Dwelling Type and Quantity: Local, Regional and State (B18 2001)

	Local	Regional
Separate House	286	7,400
Semi-detached	10	232
Flat, unit or apartment	0	604
Other	28	1,129
Not Stated	5	147
Unoccupied Private Dwellings	77	1,605
Total	**406**	**11,117**

Based on observations and anecdotal evidence from the three local councils, the information provided in Table 22 has changed substantially due to the growth in the mining industry. While visiting Moranbah, Glenden and Nebo there was considerable numbers of houses and other accommodation types (such as De-mountable units (i.e. dongers)) being constructed. Moranbah and Glenden currently have an accommodation shortage with accommodation only available for mine workers.

Community and public services and facilities

The community and public services and infrastructure provided in the regional project area is summarised in Table 23. Collinsville, Moranbah and Glenden provide the highest level of community and infrastructure services.

Table 23 Community and public services and facilities within the region

Service	Moranbah	Glenden	Nebo	Collinsville
Medical				
Hospital	ü			ü
Pharmacy	ü			ü
Community/Regional Health Centre		ü		ü
Medical Centre		ü		ü
Mental Health Centre	ü			

Service	Moranbah	Glenden	Nebo	Collinsville
Dentist	ü			ü
Physiotherapy	ü			ü
Optometrist	ü			ü
Child Care and Health				
Day Care Centre	ü			ü
Emergency Services				
Police	ü	ü	ü	ü
Fire Brigade[23]	ü	ü	ü	ü
Ambulance	ü			ü
SES	ü			ü
Crisis and Counselling Services	ü			ü
Aged Care	ü			ü
Housing Services				
Real Estate	ü			ü
Department of Housing	ü	ü	ü	ü
Other				
Education				
Pre-school	ü	ü		ü
Primary School	ü	ü		ü
High School	ü	ü		ü
Youth Activities				ü
Sporting and Recreational				
Golf Club	ü	ü		ü
Organised Team Sports	ü	ü		ü
Rodeo			ü	
Other				ü

[23] Including Rural Fire Brigade

Service	Moranbah	Glenden	Nebo	Collinsville
Public Transport				
Bus	ü			
Shopping Facilities				
Food	ü	ü		ü
Clothes	ü	ü		ü
Furniture/Electrical/Music	ü			ü
Hardware	ü			ü
Miscellaneous[24]	ü	ü		ü
Cultural Centres				
Churches	ü	ü		ü
Community centres/Art Facilities	ü			ü
Museum				ü
Library	ü	ü		ü
Services				
Banks	ü	ü		ü
Plumbing, carpentry, mechanical	ü			ü
Veterinarian	ü			ü
Australia Post	ü	ü	ü	ü
Service Station	ü	ü	ü	ü
Legal and Financial Advisors	ü			
Communications				
Telephone	ü	ü	ü	ü
Internet	ü	ü	ü	ü
Television	ü	ü	ü	ü
Radio	ü	ü	ü	ü

[24] Newspapers, books, gift shops etc

4.6.1.3 *Socio-demographic characteristics*

Table 24 shows the employment rates and breakdown at the local and regional levels. It should be noted that this information is based on 2001 data and given the growth in the coal industry may not be an accurate reflection of the current situation.

Table 24 Local, Regional and State Labour Force (B22 2001)

	Local	Regional	State
Employed F/T	764	8,365	1,002,596
Employed P/T	112	3,039	518,158
Not Stated	28	401	48,110
Employed	907	11,805	1,568,864
Unemployed	19	671	140,748
Total Labour Force	926	12,476	1,709,612
Not in Labour Force	139	6,388	1,000,121
Unemployment Rate	1.5% (average)	4.5% (average)	8.2%

Of those people employed, most of these people are employed full time with 84% of people at the local level and 71% regionally.

The average unemployment rate at the local level was significantly less at only 1.5% compared to 4.5% average for the regional level and 8.2% for Queensland.

4.6.1.4 *Existing Economic Drivers*

The main economic driver for the region is the coal industry and to a lesser extent the beef cattle industry. The Nebo Shire Council website states that the region has had significant regional growth in coal, with five new operational coal mines and the potential and capacity for another seven coal mines[25]. Traditionally the region has relied on the cattle industry for its main source of income. Recently agricultural crops including sugar, sorghum and grain have expanded in the region. Tourism does not provide a substantial income in the region.

4.6.2 Potential Impacts and Mitigation Measures

The impacts of the NML on the social and economic environment include both positive and negative impacts, with the majority of the negative impacts limited to directly affected landowners and the positive impacts more indirect and cumulative at the regional and state levels. These potential impacts are outlined in the following sections and where required mitigation measures

[25] www.nebo.qld.gov.au October 2005

have been outlined. Section 4.6.3 provides a discussion of the impacts of the project on the properties directly affected by the rail link.

4.6.2.1 Access restrictions to community and public facilities and services

Local landowners do access services in the regional project area with some landowners preferring Moranbah or Glenden for minor purchases for food, whereas others travel to Mackay or Bowen for larger purchases. In some situations the landowners have access to medical services provided by the adjacent coalmines.

The rail link will cross the Suttor Developmental Road, and during construction this may result in minor delays at this crossing. However given that construction across this road will be rapid, and there is only a small volume of traffic using this road, it is expected that any delays or restrictions will be minor.

Similarly there may be increases in the volume of traffic on the roads, but given the rural nature of the roads this will be minor and unlikely to causes concerns to other road users.

4.6.2.2 Workforce personnel and services

There is currently a skills shortage for trade and operators within the region. The level of training of construction personnel should generally be in accordance The State Government Building and Construction Contracts Structured Training Policy as it is applicable to QR policies and projects. It will be the responsibility of the Construction Contractor to ensure that workforce personnel are suitably qualified and have adequate training. During the construction phase opportunities exist to provide employment to local residents, including members of indigenous communities as in accordance with the State Government Indigenous Employment Policy for Queensland Government Building and Civil Construction projects. Strategies to provide these opportunities will include advertising in local newspapers and Internet based searches. The construction contractor is to maintain a register of local residents interested in employment during the construction phase and pursue active promotion of this workforce.

Where possible, and in accordance with the State Government DSDTI Local Industry Policy, locally sourced goods and services will be obtained or used during the construction phase. Strategies will include the encouragement of employees and contractors living at the construction camp to support local organisations, businesses, clubs and events.

Strategies that could be implemented to foster an awareness of the project and its participants in the local community could include organising friendly sporting competitions, open days and articles in the local newspaper.

4.6.2.3 Impacts of dust, noise, waste, transport and other hazards to local community

Discussions on impacts on public health as result of increases in dust, noise, waste and transport to the local community is provided in Sections 4.7, 4.8, 4.9 and 4.10 respectively.

4.6.2.4 Accommodation Requirements

There is currently a housing shortage at Moranbah, Glenden and Collinsville due to the recent growth in the coal industry. To be able to accommodate the estimated 200-construction

workforce, other forms of accommodation, such as temporary construction camps will be required. These camps will need to accommodate the majority of the construction personnel.

Given the boom in the housing sector in the region and the current high demand on temporary dwellings, they may be a delay in sourcing suitable dwellings for the construction camps, accordingly QR will implement strategies to minimise the impact on local supply.

The surrounding towns provide existing community and recreational infrastructure and social services that would be able to service the temporary construction workforce. Therefore, provided suitable accommodation is made available to the construction workforce, there should be minimal impacts to the local community and recreational facilities as a result of the project. Based on discussions with local council members, the surrounding towns will be able to absorb the additional influx of people, as these communities are already accommodated to a highly transient population as a result of the mining industry.

4.6.2.5 Benefits to local, regional, state and national economies

The benefits of the construction and operation of the NML will be experienced at the local regional and state levels. The long-term benefits are predominantly economic with the extra and alternative rail services the project will provide to the coal industry and associated industries and infrastructure, such increased revenue from greater exports and increased employment opportunities from the expansion of support infrastructure for the coal export industry, particularly in Bowen, (e.g. expansion of the Abbott Point Coal Terminal). Bowen Shire Council views the project as a catalyst for further developments in the Shire.

Construction of the NML will also provide benefits the local economy as a result of the additional personnel. For these short-term economic benefits to be maximised, the construction and operation of the construction camp(s) will need to be appropriately managed. Prior to any construction of the camp it is proposed that consultation take place with the local communities and business who could receive the economic benefits, to ensure they are maximised.

The project has a high level of significance on the local and regional economic context. There are however significant advantages at the regional level if the project was to go ahead with the development of new mines and the expansion of Abbott Point.

The project will result in the generation of jobs over an 18-24 month period. Figure 4-24 shows the approximant spread of job numbers created by the project.

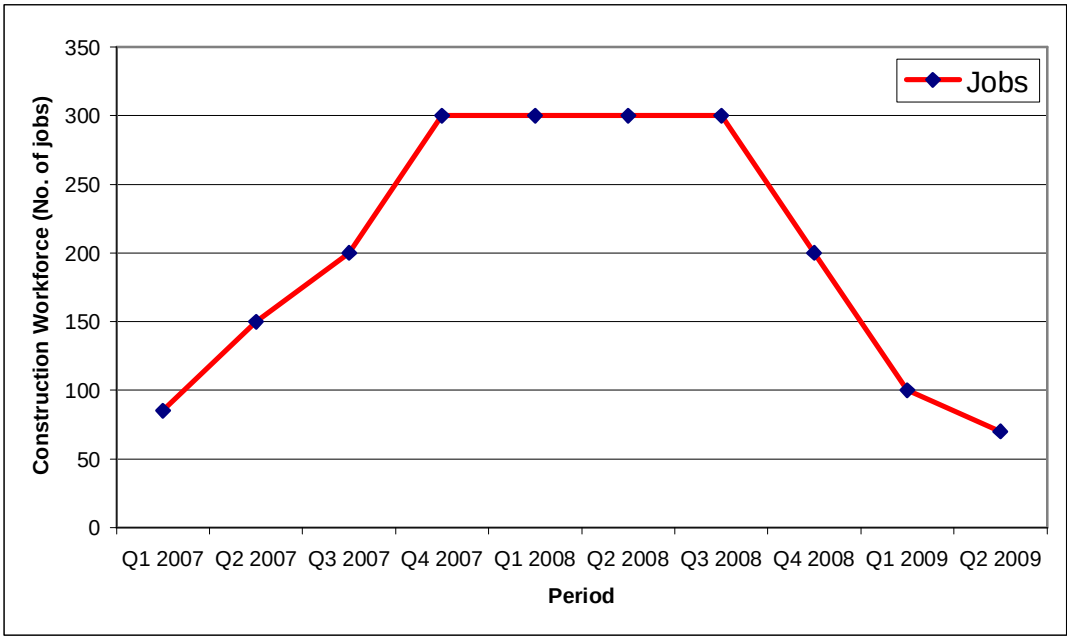

Figure 4-24 Graph showing jobs that will be created during the NML project

4.6.3 Impact upon Property Management

QR has undertaken active consultation during the planning and preliminary design phase of the project with the six directly affected landowners (seven properties). This has involved a number one-on-one meetings with the landowners to disseminate information on the project as it becomes available/finalised, this has included information on the construction and operation requirements of the project, proposed alignments, possible cattle crossing points, project timelines and identification of landowner issues. Part of the consultation has involved discussions with landowners on the process to acquire land for the NML corridor and to provide suitable compensation for the disruption to fence lines, water points, stockyards etc as a result of the rail line. This process involves initially entering into individual Options Agreement between QR and the landowner outlining the agreed cost for land acquisition, compensation for property infrastructure based on independent evaluations of the affected properties and interface agreements. This process is still being undertaken and the formal acquisition process will commence after the finalisation and approval of the EIS.

GHD has also undertaken a weeklong consultation process involving one-on-one meetings with the directly affected landowners to identify potential impacts of the project on property management.

A summary of the impacts identified by landowners as a result of the NML during the three phases of the project (design, construction and operation) is provided in Table 25. To alleviate

these impacts QR has proposed a number of mitigation measures, including crossing points, financial compensation, provision of new yards and fencing and review of alternative alignments. These impacts and proposed mitigations measures are discussed in detail below.

Table 25 Summary of impacts on property management during different phases of the project

Planning and Design	Construction	Operation
» Rail alignment impacting on property management.	» Safety of families, employees and visitors.	» Safety of families, employees and visitors.
» Consultants/contractors on property: – Administration of consultants visiting the property (time taken up with phone calls/meetings etc); – Some consultants not following QR Land Access Protocol; and – Weed movement from consultant's vehicles.	» Impact to property management on affected paddocks and loss of the corridor land.	» Impacts of coal dust on: – Grazing pastures; and – Homesteads.
» Devaluing of properties.	» Source of water for construction.	» Quality and timely maintenance of the fencing.
» Stress of negotiations process for compensation and land resumption.	» Weed and seed transfer.	» Train derailment consequences.
» Stress of uncertainties that the rail corridor might have on the future sustainability of property.	» Skills shortage for construction of replacement property infrastructure (cattle yards, fencing etc).	» Impacts to cattle movement across property: – Movement of young stock; – Alternative water points; and – Mustering of cattle.
» Negotiating process with QR (including uncertainty of where the railway	» Use to private roads by construction machinery and personnel:	» Access to paddocks (water runs, safety, fire, cattle).

Planning and Design	Construction	Operation
alignment is going).	and personnel: » Loss of access; and » Deterioration of roads and responsibility for maintenance.	cattle).
	» Increase in dust from construction activities.	» Transfer of weeds and seeds.
	» Construction workers on properties not closing gates etc.	» Devaluing of properties.
		» Loss of cattle and working dogs from train collisions.
		» Access for corridor maintenance.
		» Ability to cross rail line to fight fires (use of bull dozers etc).

4.6.3.1 Rail Alignment

A number of landowners raised concerns that the alignment of the rail link will negatively impact on property management. In these cases, QR in consultation with the landowner identified alternatives to the preferred alignment and undertook assessments on these alternatives, taking into consideration environmental, social, economic, engineering and cultural heritage aspects to determine the best alignment.

At the request of the landowners, both the Northern Alternative (refer to Section 2.3.4.1) and Southern Alternative options (refer to Section 2.3.4.3) were developed to try and minimise property severance or impacts on property management. Refer to Section 2.3 for information on the alternative alignment assessments and the determination of the preferred alignment.

4.6.3.2 Safety

A major concern for landowners during construction and operation of the rail link was the safety of their families, workers and visitors to the properties. A preliminary count of people living and working on the properties is fifty. The following safety issues were raised:

» Using railway crossings during mustering and while conducting property maintenance (water runs) (refer to example below). A number of the properties have young children and youths that assist in the mustering and there is concern for their safety.

- Fire and fire fighting - the railway would possibly hinder the landowners ability to access an area with the suitable fire fighting equipment (rubber tyre vehicle vrs tracked vehicle) to fight the fire.
- Safety of cattle and working dogs – if cattle or working dogs get onto the corridor and are killed or maimed.

An example of a safety issue in crossing the rail corridor includes:

For a single person to cross the railway at a level crossing – having to go through a gate, the following example was given:

1. Open and shut the gate;
2. Cross over the railway line – making sure there are no trains;
3. Open and shut the gate on the other side of the railway;
4. Do the work required (e.g. check a watering point);
5. Open and shut the gate;
6. Cross back over the railway line – making sure there are no trains; and
7. Open and shut the gate.

This is in comparison to where the worker on the property could have gone straight to the task at hand. It presents a safety issue for the worker – particularly if crossing with a motorbike or a horse, or at night.

Measures to mitigate the impact of increased safety risk as result of the rail corridor include provision of bridges for farmers to cross under the railway and development of a Communication Strategy. This will enable relevant and timely information to be distributed directly to affected landowners. A person is required to coordinate ongoing community and business liaison. This will allow landowners to call and find out proposed train times, thereby allowing efficient movement of cattle over the rail line.

Provisions have been made to allow fire fighting equipment to cross the corridor (refer to Section 4.6.3.6).

To minimise stock access onto the rail corridor, QR will ensure that the fencing along the rail line is constructed from quality materials and that the fence line will be regularly checked and maintained regularly, especially immediately after flood events.

4.6.3.3 Consultants on Properties

Flow on affect of the planning for the project means that there are consultants on the properties to undertake the various studies (flora/fauna, geotechnical, cultural heritage). Issues that landowners raised with respect to consultants include:

- Time taken up to administer the visits of consultants on their properties.
- Consultants accessing rail line via use of GPS points and not informing landowner; and

» Consultants accessing property after heavy rainfall and causing damage to internal roads.

For this project QR has implemented a Land Access Protocol (Appendix J) for visiting consultants to follow, this includes informing the landowners of time of access, following any directions given by the landowner, closing gates and taking out all wastes/rubbish.

4.6.3.4 Impacts to property management during construction

During the construction phase the landowners identified that while constructing the rail link through paddocks that these paddocks may become unusable if water and fencing is not provided prior to construction. The paddocks affected will not be able to be utilised and therefore become uneconomical to the landowner. If the paddocks cannot be utilised then the landowners will have to find other appropriate paddocks on their property or adjist the cattle on another property.

To minimise the impact of construction activities on paddock usage and property operation, landowners identified a preferred order for construction:

A. Provision of watering points for cattle on both sides of the rail corridor;

B. Construction of fences along the railway corridor; and

C. Construction of the railway.

QR is committed to adopting this order of construction for the project to minimise the impacts on property management.

4.6.3.5 Construction personnel on properties and road access

Landowners raised concerns about the impacts of having construction personnel on their properties. The properties are large and the landowners cannot keep an eye on all their property at once, so are reliant on the construction workers not to do any damage to the property, livestock or infrastructure. Part of this is ensuring that gates are closed at the time they are passed through. In addition some landowners have small children that live or visit the properties and there is a concern for the safety of these children with respect to large camps of construction workers close to homesteads.

There are a number of landowners whose main access road or other internal roads, will be crossed by the railway. This poses safety issues, especially for the landowner whose main access road is crossed.

Landowners are also concerned about the potential degradation to their roads from large machinery during the construction phase. Concerns include:

» Restrictions in accessing roads during the construction phase;

» Construction personnel and machinery using unapproved roads or tracks for short cuts; and

» Maintenance and restoration of all used roads after construction phase to original conditions.

As part of the construction contract, QR will ensure that the construction contractor liaises and negotiates with the landowners for the use of certain roads and enters into an agreement with

them that states which roads will be used, agreed restoration condition and time frame to complete restoration works. Should the contractor be required to use other roads on the properties (such as in an emergency), the contractor is responsible for but not limited to:

» Minimising any damage caused and immediately reporting damage to the landowner;

» Organisation and payment for the repair to any damage caused; and

» Leaving access to road clear at all practicable times.

Construction personnel will be briefed on requirements to close gates etc.

4.6.3.6 Severance of paddocks, mustering laneways and other infrastructure

The most significant impact of the project on property management is the severance of paddocks and laneways on each of the properties. Depending on the position of the rail corridor within each of the properties the ability of the paddock and property to be managed viably varies along the alignment. Table 26 provides shows the number of paddocks and laneways that will be affected on each property.

Table 26 Number of affected paddocks and laneways for each property along the preferred alignment

Property	Number of paddocks affected	Number of laneways affected
Denham Park	5	1
Bilyana	2	-
Lancewood	8	3
Wollombi	5	2
North Suttor	6	1
Byerwen	4	-
TOTAL	**30**	**7**

Impacts as a result of paddock severance include:

» Reduction in paddock size and viability;

» Impacts to the important Bullock or fattening paddocks[26];

» Disruptions to water sources;

» Ability to economically muster cattle (via helicopter or horse); and

[26] A bullock paddock is used to fatten the bullocks prior to sale, it generally produces the best quality and highest nutrition grass

» Impact on cattle movement (especially along existing laneways).

Each time the cattle need to be moved between a paddock or to the central stockyards, they need to be mustered and laneways are set up to assist in this process. Laneways are one method that allows properties to be more economically viable as it means that fewer people are required to move cattle around the property. On some of the properties the rail corridor will result in the severance of all the existing laneway configurations, requiring new laneways to be constructed, provision of bridges or occupational crossings or the two halves of the property to be managed separately.

Without the provision of suitable mitigation measures the above impacts could result in a reduction in the economic viability of the property due to the following:

» Increased costs in employing additional people during mustering;

» Increased time spent during mustering as result of badly shaped paddocks (triangle) or time required to move stock additional distances to cross the rail line; and

» Loss of stock condition due to additional distances to be travelled to access stockyards, watering points.

In addition landowners raised concerns about the impact the rail corridor both only causing fires and acting as a hindrance to fighting fires (ability to quickly access the fire with appropriate equipment) and maintaining firebreaks.

In order to minimise the impact of the rail corridor on property management QR is committed to providing properties owners with financial compensation for the replacement or duplication of infrastructure (fencing, stock yards, water points) and provisions of adequate crossing points over the railway corridor to allow cattle and vehicle movement.

QR has undertaken consultation each of the landowners, in which two forms of crossings (occupational at-grade crossings and railway bridge underpasses) and the most suitable locations have been discussed. Based on these discussions and engineering constraints QR has committed to providing a total of 16 private crossings along the alignment to accommodate stock and vehicle movement, the approximant locations and types of crossings are summarized in Table 27. The final design and exact location of each of the crossings is to be determined as part of the detailed design phase of the project and needs to be agreed with the respective landowner. The approximant locations of these crossings are shown in Appendix E.

A further four crossing have been provided over the larger creeks, the Suttor Developmental Road and the Cerito-Elphinstone Road.

From Table 27, it can be seen that the number of crossing for each property ranges from one to five. The function, location and number of crossings will be discussed further as part of the land acquisition discussions with the property owners.

Table 27 Proposed Cattle, Vehicle and Machinery Crossings

Approximant Location[27]	Crossing Type	Permitted Usage of Crossing	User
215.875 km	Occupational Crossing	» Sunwater Maintenance Vehicle » Farm Vehicle » Bulldozer & Farm Implements (special procedures required)	» Sunwater » Denham Park
218.350 km	Occupational Crossing	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements (special procedures required)	Denham Park
222.045 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Cattle Truck » Bulldozer & Farm Implements (special procedures required) » Scrub Pulling Chain	Denham Park
226.615 km	Bridge: Kennedy Creek	Nil	Nil
231.445 km	Bridge Underpass: Eaglefield Creek	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements » Scrub Pulling Chain	» Stock Route » Bilyana
233.195 km	Public Crossing (flashing lights) and public stock crossing	All Road Vehicles and Livestock	Public

[27] Based on the Goonyella system chainage

Approximant Location[27]	Crossing Type	Permitted Usage of Crossing	User
233.605 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements » Scrub Pulling Chain	Lancewood
237.495 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements » Scrub Pulling Chain	Lancewood
242.295 km	Occupational Crossing	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements	Lancewood
245.425 km	Occupational Crossing	» Livestock » Vehicle » Farm Vehicle » Cattle Truck » Bulldozer & Farm Implements	Lancewood
248.345 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements » Scrub Pulling Chain	» Stock Route » Lancewood
248.975 km	Bridge Sutter Creek	Nil	Nil
252.745 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements	Wollombi

Approximant Location[27]	Crossing Type	Permitted Usage of Crossing	User
		» Scrub Pulling Chain	
255.675 km	Occupational Crossing	» Livestock » Vehicle » Farm Vehicle » Cattle Truck » Bulldozer & Farm Implements	Wollombi
257.195 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements » Scrub Pulling Chain	» Stock Route » Wollombi
259.915 km	Occupational Crossing	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements	Suttor North
261.395 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements » Scrub Pulling Chain	Suttor North
266.595 km	Occupational Crossing	» Livestock » Vehicle » Farm Vehicle » Cattle Truck » Bulldozer & Farm Implements	Suttor North
271.395 km	Grade Separation (road over rail) for the Cerito to Elphinstone Road	All Road Vehicles	Public

Approximant Location[27]	Crossing Type	Permitted Usage of Crossing	User
277.000 km	Bridge Underpass	» Livestock » Vehicle » Farm Vehicle » Bulldozer & Farm Implements » Scrub Pulling Chain	Byerwen

Note:

- » Livestock Cattle and horses;
- » Vehicle 2 and 4 wheel drive cars and motor bikes;
- » Farm Vehicle Quad bikes, single body cattle truck, rubber tired tractor, and horse and rider;
- » Cattle Truck B double decker road train or equivalent;
- » Bulldozer & Farm Implements Metal tracked machinery including bulldozers with or without a stick rake or blade plough, and farm ploughs or equipment that could damage the railway tracks when traversing the railway (excluding Scrub Pulling Chains); and
- » Scrub Pulling Chains Large heavy chains used for clearing scrub

Maximum vehicle dimensions when crossing the lines to be:

- » Maximum height to be 4.3 metres;
- » Maximum width to be 10.7 metres.

Occupational Crossings

Crossings are expected to be of similar design to that used on the recently completed Bauhinia Project. These crossings will generally be used as specified above to facilitate the crossing of road vehicles, farm machinery, metal tracked vehicles such as bulldozer (special procedures required to avoid damage to the rail surface and track alignment) and cattle. Pulling of scrub clearing chains across the railway is not to be a permitted use and these must be transported via truck across the crossing or through a railway bridge underpass.

Railway Bridge Underpasses

These are to be designed to facilitate the passage of cattle and all types of farm equipment including a bulldozer with a 10.7 metre wide blade. Cattle management issues are to be considered as part of the design. These accesses are to be designed to be self draining and if drainage structures are required in the area then separate bridge spans, structures or channels will be provided. Each approach under the bridge is to have an appropriate hard stand area on both sides of the bridge for the width of the rail corridor.

4.6.3.7 Cattle Grazing

Landowners have raised concerns on the impact that the rail line will have on cattle grazing, these impacts include:

- Pastures being unpalatable to cattle due to presence of coal dust on grass; and
- Cattle, especially immature bullocks, running away from passing trains and not uniformly grazing a paddock (i.e. wasted pasture areas close to the rail line). It is expected that the older and mature heifers will become accustomed to passing trains, but the younger bullocks will be frightened and not graze near the line, resulting in lost grazing area, as well as lessen ability for the bullocks to put on valuable weight for market profits.

There is anecdotal evidence that the majority of the coal dust settles out onto the grass within the corridor and has minor impacts on surrounding paddock grasses. Inspection of an existing coal rail line in the region showed that within 30 m of the rail line there was little visible evidence of coal dust on the grass leaf blades.

4.6.3.8 Weed and Seeds Transfer

An ongoing concern for the landowners is the management of weeds. The negative impacts of weeds on the properties includes (but is not limited to):

- Pressure from Department of Natural Resources and Mines to control weeds on their land as a requirement under legislation;
- Decrease in the viability of paddocks – cattle can not eat the weeds and the weeds dominate the native grasses which the cattle feed on; and
- Source of the weeds – weeds can be spread through a number of sources. One example provided by a landowner was when a vehicle is transporting gravel – the weed seeds are in the gravel and gravel dust, gravel is deposited on the side of the road, it rains and the weed seeds travel down stream to the landowners property and begin to grow. The most common source of weeds is vehicles.

Landowners raised the potential impact of weeds during the construction of the railway particularly as the vehicles will be travelling along the corridor and in and out areas where weeds are currently not controlled. QR is committed to the preparation and implementation of a weed management plan during construction and operational phases of the project. Measures are outlined in Section 5.8.1.5 and include the provision of vehicle wash down bays, vehicle signage to demonstrate that they are weed free and training of construction personnel.

4.6.3.9 Skills shortage and impact on property infrastructure

There is a skills shortage in the region due to many of the contractors being employed by the mines. This skills shortage is likely to affect a landowner's ability to construct new infrastructure (such as yards, fences etc) on their property as a result of the impacts caused by the rail corridor.

The impact of the skills shortage on the landowners is twofold:

- Timing – the landowners have to wait for the contractors to be available (experience has shown that this is sometimes in excess of six weeks).
- Costs – with the mines paying elevated wages, the contractors are asking the landowners to pay comparable rates to complete the same work.

The combination of timing and costs will effect the negotiations for compensation with QR, many landowners expressed the concern of quoting prices for infrastructure (such as cattle yards, fencing) at today's prices but by the time negotiations are completed and they can arrange for the contractors to do the work the prices may have escalated (for both labour and materials).

Landowners also raised their concern about the supply and demand relationship with the contractors which will also affect the cost and demand of services and materials. With seven properties directly affected by the railway all requiring similar materials and services, increasing the demand on time and cost.

To address this issue QR are willing to assist in a co-ordinated approach with the landowners and contractors to ensure that the infrastructure changes required are constructed in a timely manner and quick payment of compensation through the Options Agreements as part of the land acquisition process.

4.6.3.10 Impacts on economical viability of affected properties

The rail corridor may have a negative impact on the economic viability of the affected properties due to alterations in property management. QR have committed to a number of mitigation measures (such as crossing points, construction order, compensation for lost infrastructure) to alleviate these impacts.

It is difficult to accurately predict the true cost of the rail link on the livelihood of the directly affected landowners however estimates have been prepared as part of the valuations for the Options Agreements to acquire the rail corridor. Based on the experiences of other properties within the district that have operational coal rail lines, these properties show that it is possible to manage a viable cattle property provided there is good line of communications to ensure that any concerns are addressed appropriately. To this end, QR is willing to work with the directly affected landowners to minimise these impacts.

4.6.3.11 Summary of Mitigation Measures

The following table provides a summary of the potential impacts of the rail corridor on property management and the measures QR have proposed to mitigate these impacts.

Table 28 Mitigation measures to impacts on property management

Potential Impact	Proposed Mitigation Measure
Safety	» Provision of a phone number to QR train operations to allow landowners to efficiently manage cattle movement across the rail line. » Education of landowners and appropriate signage
Stock accessing rail corridor	» Fencing along the rail line is constructed from quality materials and that the fence regularly checked and maintained by QR.
Consultants on property	» Continual implementation of QR's Land Access Protocol.

Property management during construction	»	The following order of construction will be adopted for the project, where practical: – Provision of watering points for cattle on both sides of the rail corridor; – Construction of fences along the railway corridor; and – Construction of the railway.
Construction personnel on properties and road access	»	Included in the construction contract documents will be requirements for the construction contractor to liaise with landowners for the use of certain roads and enter into agreements with them that states which roads will be used, agreed restoration conditions and time frames to complete restoration works. Construction personnel to be briefed on requirements to close gates etc.
Property severance and economic viability	»	Financial compensation as part of the Options Agreement for the replacement or duplication of infrastructure (fencing, stock yards, water points). » Provision of designated rail-crossing points (combinations of rail bridges and level crossings) across the affected properties to allow cattle and vehicle movement (minimum of one on each property).
Weed and seed transfer	»	Preparation and implementation of a Weed Management Plan (WMP) during construction and operational phases of the project. WMP to include details of vehicle wash down bays, vehicle signage and training.
Skills shortage	»	Establishment of a co-ordinated approach between landowners, QR and contractors to ensure that the new infrastructure are constructed in a timely manner.

4.6.4 Summary of Commitments

A summary of the measures QR is committed to undertaking to minimise impacts to social and economic environment and on property management are provided below.

Management Commitments
30. Implement strategies to provide employment to local residents, including advertising in local newspapers, maintaining a register of local residents interested in employment during the construction phase and implementing the State Government Policy on Indigenous Employment.
31. To ensure that the construction contractor generally implements the State Government Building and Construction Contracts Structured Training Policy as applicable to QR policies

and projects.
32. Implement strategies to involve local groups/businesses during the construction of the rail link including the State Government DSDTI Local Industry Policy.
33. Establishment of a Communication strategy to allow register of complaints and for information to be distributed to the community.
34. QR will actively work with the landowners to implement the mitigation measures for impacts on property management outlined in the EIS (Table 28) in a coordinated manner.

4.7 Air Environment

4.7.1 Description of environmental values

The proposed rail corridor is located within a rural setting. Air sensitive receptors within the project area are associated with the cattle properties the corridor will cross and include homesteads, cattle yards and workers cottages. Two homesteads, Denham Park and Wollombi Station, are located within close proximity to the corridor (1850 m and 1350 m respectively). Several cattle yards are also located within close proximity to the corridor. The location of these air sensitive receptors is shown in Figure 4-1 to Figure 4-4.

Climatic patterns have a strong influence over the current and future air quality of the region and, due to the low rainfall experienced (17.1 mm - July mean) results in increased susceptibility to dust generation during winter months. The combination of constant low relative humidity and high atmospheric temperatures, as discussed in Section 4.2, creates high evaporative potential, which also contributes to increased dust generation within the region. Winds are generally of low speed (<10 km/hr) with the prevailing direction from the north and north east in spring/summer and the southeast in autumn/winter (QR 1992).

Dust from stock movement, working cattle yards and high wind is the current main source of particulates within the study area. As the land is primarily utilised for grazing, it is largely cleared and is therefore subject to wind erosion.

4.7.2 Potential Impacts and Mitigation Measures

The primary air quality impacts related to the construction and operational phases of the proposed rail link are:

- Dust generation in the locality of homesteads and workers cottages resulting from construction activities such as earthworks, topsoil removal and storage, haulage on transport routes and internal roads;
- Dust generation at intersection of Suttor Developmental Road;
- Emissions from construction equipment, diesel powered locomotives and vehicles; and
- Generation of coal dust during operation.

Although there is potential for significant dust generation during the construction phase of the project, the impacts are expected to be minimal due to the remoteness of the majority of residences from the corridor. However, there are two residences that are located within two kilometres of the preferred alignment (Denham Park and Wollombi Station) that could be impacted by the project. Potential impacts specific to these two homesteads are provided below. All remaining residences are located more than five kilometres from the proposed rail corridor and accordingly impacts on air quality for these residences will be negligible. Similarly, due to the distance of dwellings to the corridor, topography and vegetation, it is not likely that machinery emissions, emissions from diesel powered locomotives, or facility emissions will impact on these residents.

Denham Park homestead is almost completely surrounded by eucalypt woodlands and this vegetation would provide some buffer from dust generated during construction and coal dust during operation. In addition the main cattle yards are located adjacent to the homestead and during mustering dust generated by these activities would be significantly greater than dust from the rail corridor.

The preferred alignment is located on a ridgeline above and 2400 meters to the east of Wollombi homestead. During construction and operation, any easterly winds may result in dust, exhaust emissions or coal dust being blown directly towards the homestead. There is limited information on the local wind conditions for Wollombi Station, however given the distance of the homestead to the rail line impacts from dust and coal dust should be minimal. During the construction phase, in the vicinity of Wollombi homestead particular care is to be taken to ensure dust generation is minimised through regular watering of vehicle tracks and ballast supplies. Where possible any clearing activities in the vicinity of the homestead should avoid windy days.

The proposed rail link intersects with Suttor Developmental Road and other small private farm roads and motorist visibility may be affected as a result of dust generation during construction. The impact is likely to be minimal as construction in this region will be rapid and the Suttor Developmental Road at the point of crossing experiences low traffic volumes (61 cars/day – 2004).

As the proposed rail link is expected to accommodate between three and twenty nine trains daily, the generation of coal dust during haulage is likely. However, as the majority of residences are more than five kilometres from the proposed corridor (with the exception of Denham Park and Wollombi which are discussed above), the impact from coal dust generation is expected to be minimal.

4.7.2.1 Management Measures and Commitments

In order to minimise impacts from dust generation during the construction phase of the project QR are committed to undertaking the following measures.

Management Commitments
35. QR will address issues with respect to dust generation and emissions in line with the EMP – Air Quality outlined in Chapter 5 of the EIS.

4.8 Noise and Vibration

David Moore and Associates Pty Ltd undertook a detailed noise assessment of the project area to determine potential impacts of the rail corridor on surrounding homesteads, this report and subsequent calculations is provided in Appendix K. A summary of the findings of this report is provided below.

4.8.1 Description of environmental values

4.8.1.1 Noise sensitive receptors

The proposed rail corridor is located within a rural setting and sensitive noise and vibration receptors within the project area include adjacent homesteads and workers cottages. Two homesteads, Denham Park and Wollombi Station, are located within close proximity to the corridor (1850 m and 1350 m respectively). Denham Park is almost completely surrounded by tall eucalypt vegetation which would be provide some protection from noise sources. The location of these two sensitive receptors is shown in Figure 4-1 to Figure 4-4.

Ambient noise levels

To assess the current ambient noise levels associated with homesteads in the project area, noise loggers were established at two affected homesteads for a one-week period on Saturday 3 September 2005. Both noise loggers were located within approximately 15 metres of the residences and the measured noise levels would be representative of the ambient noise levels at these residences.

The existing background noise of the project area is consistent with that of most rural areas, consisting primarily of insect, bird and wind noise, with occasional machinery noise from activities on homesteads. Background noise levels at the two closest properties to the rail corridor (Denham Park and Wollombi), presumed to be similar, are provided in Table 29.

Table 29 Results of Ambient Noise Level Measurements, Monitoring Location A (Denham Park)

Day	Date	Time period	Ambient Noise Level, dB(A)					
			L_{Aeq}		L_{A10}		L_{A90}	
			Range	Average	Range	Average	Range	Average
Saturday	3.09.05	daytime	30.3-45.0	37.8	32.2-46.5	39.0	27.7-33.4	30.4
Saturday	3.09.05	evening	29.9-38.6	36.5	21.7-50.5	39.5	18.7-27.9	24.1
Saturday/ Sunday	3/4.09.05	night-time	32.4-52.9	43.7	32.1-52.4	44.8	23.3-37.8	31.3

Day	Date	Time period	Ambient Noise Level, dB(A)					
			L_{Aeq}		L_{A10}		L_{A90}	
			Range	Average	Range	Average	Range	Average
Sunday	4.09.05	daytime	31.1-42.8	38.1	31.8-46.7	40.9	24.7-35.8	32.0
Sunday	4.09.05	evening	40.2-48.2	43.8	42.1-50.9	46.8	34.9-40.6	38.1
Sunday/ Monday	4/5.09.05	night-time	32.8-61.2	50.4	36.3-58.5	51.3	25.0-48.7	41.1
Monday	5.09.05	daytime	33.0-44.3	39.6	34.0-48.1	41.1	24.9-36.5	32.7
Monday	5.09.05	evening	36.0-50.9	43.2	36.4-51.6	44.9	33.7-41.0	37.2
Monday/ Tuesday	5/6.09.05	night-time	31.7-50.0	43.5	32.4-53.4	45.3	24.2-40.4	31.7
Tuesday	6.09.05	daytime	35.5-45.5	41.0	36.8-48.9	42.5	28.7-39.9	36.6
Tuesday	6.09.05	evening	21.9-49.1	40.7	21.0-53.3	41.3	18.2-34.9	29.2
Tuesday/ Wednesday	6/7.09.05	night-time	36.0-58.4	47.1	37.7-61.5	50.4	24.7-36.7	30.8
Wednesday	7.09.05	daytime	36.3-49.2	42.8	37.1-52.5	45.0	34.1-40.6	38.3
Wednesday	7.09.05	evening	27.6-45.7	37.3	28.6-50.1	40.3	23.3-36.1	28.1
Wednesday/ Thursday	7/8.09.05	night-time	36.2-54.1	45.0	37.3-57.9	47.2	26.1-44.0	36.4
Thursday	8.09.05	daytime	36.6-50.9	44.7	36.9-53.6	47.1	34.2-45.5	40.3
Thursday	8.09.05	evening	27.9-53.6	41.6	27.4-52.1	41.8	22.7-36.8	30.4
Thursday/ Friday	8/9.09.05	night-time	36.7-49.3	45.0	39.9-51.4	47.4	26.2-38.9	33.6
Friday	9.09.05	daytime	30.3-45.0	37.8	32.2-46.5	39.0	27.7-33.4	30.4

From Table 29, the following average ambient noise levels should be noted:

» Average L_{Aeq}
  – daytime: 37.8, 43.7, 50.4, 43.5, 47.1, 45.0, 45.0 Average = 44.6 dB(A)
  – evening: 36.5, 38.1, 39.6, 41.0, 42.8, 44.7 Average = 40.5 dB(A)
  – night-time: 43.8, 43.2, 40.7, 37.3, 41.6 Average = 41.3 dB(A)
» Average L_{A10}
  – daytime: 39.0, 44.8, 51.3, 45.3, 50.4, 47.2, 47.4 Average = 46.5 dB(A)
  – evening: 39.5, 40.9, 41.1, 42.5, 45.0, 47.1 Average = 42.7 dB(A)
  – night-time: 46.8, 44.9, 41.3, 40.3, 41.8 Average = 43.0 dB(A)
» average L_{A90}
  – daytime: 30.4, 31.3, 41.1, 31.7, 30.8, 36.4, 33.6 Average = 33.6 dB(A)
  – evening: 24.1, 32.0, 32.7, 36.6, 38.3, 40.3 Average = 34.0 dB(A)
  – night-time: 38.1, 37.2, 29.2, 28.1, 30.4 Average = 32.6 dB(A)

4.8.1.2 Rail Noise Limits

The rail noise limits adopted for the for the project area are in accordance with the Environmental Protection (Noise) Policy 1997:

» The planning levels for a railway are the following noise levels, assessed 1 m in front of the most exposed part of an affected noise sensitive place –
  – 65 dB(A), assessed as the 24-hour average equivalent continuous A-weighted sound pressure level;
  – 87 dB(A), assessed as a single event maximum sound pressure level.

The noise limits for Queensland Rail are the same as the above.

4.8.2 Potential Impacts and Mitigation Measures

4.8.2.1 Potential Impacts

The potential noise impacts of the proposed rail corridor are:

» Elevated noise levels from construction machinery and equipment during construction.
» Elevated noise levels from the operation of diesel and electric powered coal trains.

These are discussed further below.

4.8.2.2 Construction Noise

During the construction phase of the proposed rail corridor, nuisance to residents may arise from the use of existing roads located in close proximity to homesteads, for the transportation of construction materials. These impacts will be dependent on the chosen transport routes and schedules.

Construction machinery will potentially produce noise exceeding that of existing background noise in the region, possibly causing annoyance to residents of Denham Park and Wollombi.

QR is committed to undertaking the following measures to mitigate noise during construction activities.

Management Commitments
36. QR is committed to address issues with regard to noise and vibration by implementation EMP – Noise and Vibration outlined in Chapter 5 of the EIS.

Provided the above measures are incorporated, impacts from construction noise on homesteads is considered to be minimal given the large separation distances and presence of buffers such as vegetation.

4.8.2.3 Operational Source Noise Levels

To determine the proposed rail noise levels, measurements were obtained for a section of railway approximately 5 kilometres east of Duaringa, where the highway is set back from the railway approximately 4 or 5 kilometres but there is an unsealed road along the railway. The noise measurement equipment was set up at the following distances from the railway line, which were elevated approximately 2 metres above natural ground level:

- 50m;
- 100m;
- 200m and;
- 300m.

A different set of equipment was used at each of these locations and set to sample at 10 second intervals. The purpose of these noise level measurements was to assess passing train noise levels as well as distance noise reduction from the railway line. Between the railway line and the monitoring locations was bare earth, compacted for the first 50 metres then ploughed for the remaining distance out to 300 metres and beyond.

Table 30 Results of Source Noise Level Measurements, Duaringa

Activity	Noise Levels, dB(A)				Duration of Measurement	Train Type
	$L_{Aeq,T}$	$L_{A1,T}$	$L_{A10,T}$	Maximum		
50 metres from railway line						
Electric locomotives and empty coal wagons	76.2	80.9	79.7	81.6	2 min 0 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	75.0	80.9	79.4	82.1	1 min 50 secs	
Electric locomotives and full coal wagons	73.1	78.6	75.7	79.4	2 min 10 secs	
100 metres from railway line						
Electric locomotives and empty coal wagons	71.9	76.4	75.6	77.0	2 min 10 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	69.5	74.3	72.6	76.6	1 min 50 secs	
Electric locomotives and full coal wagons	68.0	72.7	70.9	73.3	2 min 10 secs	
Diesel locomotives and freight wagons	72.2	79.7	77.4	80.0	1 min 0 secs	Three locomotives in front
200 metres from railway line						
Electric locomotives and empty coal wagons	65.4	70.2	69.2	71.6	2 min 50 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	62.3	67.1	65.6	68.9	2 min 10 secs	
Electric locomotives and full coal wagons	61.1	65.9	64.0	69.1	2 min 10 secs	
300 metres from railway line						
Electric locomotives and empty coal wagons	62.2	65.9	65.1	66.6	2 min 30 secs	Two locomotives in front, two in the middle
Electric locomotives and full coal wagons	58.8	62.8	61.7	64.9	2 min 20 secs	
Electric locomotives and full coal wagons	58.8	62.8	61.7	64.9	2 min 20 secs	

The above source noise levels were plotted and the noise reduction determined for the overall train passby noise ($L_{Aeq,T}$) and the maximum train noise.

From approximately 300 metres from the railway line the L_{Aeq} noise level reduces by approximately 3 dB(A) per doubling of distance, and the maximum noise level by approximately 6 dB(A) per doubling of distance. This is the noise attenuation for distance that has been applied in this report.

If it is assumed that the duration of the passing train is 2 minutes 50 seconds (longest of the above measurement durations) and there are 29 trains per day (maximum anticipated number), then the total duration of the train passing will be 1 hour 12 minutes and 16 seconds per day (0.9445 hours). The noise level of the passing electric trains is 61 dB(A) L_{Aeq} at 300 metres. The overall average ambient noise level is 42.1 dB(A), $L_{Aeq,24h}$, which would be the noise level for 23.0555 hours. If it is further assumed that all of the trains on the proposed missing link are diesel and the noise level of the diesel is 3 dB(A) greater than that of the electric, then the $L_{Aeq,24h}$ will be 48.1 + 3 = 51.1 dB(A) $L_{Aeq,24h}$ at 300 metres. The maximum electric train noise level at 300 metres was 66.6 dB(A), whilst the difference between electric and diesel train noise was 6.7 dB(A) maximum. Therefore, at 300 metres, the maximum noise level of a passing diesel train would be 66.6 + 6.7 = 73.3 dB(A).

Based on the measured train noise levels the noise of 29 diesel coal trains per 24-hour day would be 51.1 dB(A) $L_{Aeq,24h}$ and 73.3 dB(A) maximum, at a separation distance of 300 metres. These train noise levels easily comply with the noise limits, with these noise levels being 14 dB(A) less than the respective noise limits.

The separation distance of 300 metres is the distance from the railway line that the $L_{Aeq,24h}$ noise level starts to reduce by approximately 3 dB(A) per doubling of distance and the maximum noise level reduce by approximately 6 dB(A) per doubling of distance. The minimum separation distance of the rail corridor from the two homesteads is:

» approximately 1850 meters to the east of Denham Park; and

» approximately 1350 metres east of Wollombi.

At these separation distances rail noise levels will be approximately as follows:

» Denham Park:
  – 51.1 – 6 = 45.1 dB(A) $L_{Aeq,24h}$;
  – 73.3 – 12 = 61.3 dB(A) maximum;

» Wollombi:
  – 51.1 – 9 = 42.1 dB(A) $L_{Aeq,24h}$;
  – 3.3 – 18 = 55.3 dB(A) maximum.

These noise levels easily comply with the nominated rail noise limits.

Based on the above, noise at any farming infrastructure at a distance 300 m or greater from the rail corridor will easily comply with the nominated noise limits.

The current ambient $L_{Aeq,24h}$ is 42.1 dB(A), which the noise of the passing trains will exceed by approximately 3 dB(A). Therefore the current ambient maximum noise levels are similar to the maximum passing train noise levels.

Based on the above the rail corridor will have negligible impacts to noise sensitive receptors and no further mitigation measures are required for the operation of the rail corridor.

4.8.2.4 Vibration

During both the construction and operational phases, there is a low probability of effects from vibration, as the proposed rail corridor is located at a minimum distance of 1350 meters from the nearest residence.

4.9 Waste

4.9.1 Waste Generation and Volumes

The activities that are associated with the generation and disposal of waste relevant to the NML project include:

- Operation of construction camp;
- Plant and equipment maintenance;
- Batch plant operation;
- Road construction;
- Concreting activities;
- Installation of infrastructure;
- Construction of structures;
- Decommissioning of the site; and
- Sanitary facilities.

Table 31 identifies the range of solid, liquid, gaseous and hazardous wastes that are likely to be generated during each aspect of the project. The potential exists to recycle or reuse a large proportion of the waste material generated by these activities. This will effectively reduce the cost of disposal and volume of waste sent to landfill over the period of the project. Given the potential to recycle or re-use waste products, the estimated volume of waste to be generated cannot be calculated at this stage for the project. Information on waste volumes will be able to be determined during the detailed design phase.

Table 31 Wastes likely to be generated

Aspects	Solid	Liquid	Gaseous	Hazardous
Construction camp operation				
	Paper	Sanitary waste	-	-
	Litter	-	-	-
	Toner cartridges	-	-	-
	Paper Litter	Sanitary waste	-	-
	PET Plastic bottles	-	-	-
	Aluminium cans	-	-	-
	Milk cartons/bottles	-	-	-
	Food Scraps	-	-	-
Plant and equipment maintenance				
	Plastic (containers) Tyres Litter Cable Parts Batteries	Oil and Grease	Refrigerant/ air conditioning gas. Emission of greenhouse gases and air pollutants	Gases that are compressed, liquefied or dissolved under pressure may be hazardous. Flammable liquids including oil, grease and petroleum compounds are also hazardous liquids, including petroleum compounds are also hazardous
	-	Lubricant Radiator fluid Hydraulic Fluid Wastewater	-	-
Batch plant operation				
	Concrete Additives	Wastewater Slurry	Emission of greenhouse gases and air pollutants	-

Aspects	Solid	Liquid	Gaseous	Hazardous
Concreting activities				
	Concrete	Curing compound Slurry	Emission of greenhouse gases and air pollutants	-
	-	Wash-down water Green cutting run-off from bridges	-	-
	-	Alkaline curing run-off from bridges	-	-
Road				
	Earth	Wastewater	Emission of air pollutants	-
Construction				
	Bitumen	Bitumen / Oils	-	-
Installation of infrastructure				
	Metal	Paint	-	-
	Timber Concrete	-	-	-
	Wire Cable	-	-	-
Construction of Structures				
	Concrete	Wastewater	-	-
	Steel	-	-	-
	Earth	-	-	-
	Metals	-	-	-
Decommissioning of the site (incl. removal of pollution controls)				
	Synthetic materials (e.g. sediment fencing, geotextile fabric)	Sanitary wastes	Refrigerant/ air conditioning gas	Gases that are compressed, liquefied or dissolved under pressure may be hazardous

Aspects	Solid	Liquid	Gaseous	Hazardous
	Timber	-	-	-
	Metal Concrete	-	-	-
Sanitary facilities				
	-	Wastewater	-	-

4.9.1.1 Potential Waste Impacts

Table 32 outlines the potential impacts to the environment from waste generation.

Table 32 Potential Waste Impacts

Aspect	Potential Impact
Sanitary Facilities	» Pollution of local waterways
Plant and equipment maintenance	» Pollution of local waterways » Emission of air pollutants » Contaminated land
Batch Plant operation	» Pollution of local waterways » Emission of air pollutants
Concreting	» Pollution of local waterways » Run-off of curing compound

4.9.2 Waste Management

It is envisaged that construction waste volumes would be kept to a minimum and where possible treated within site boundaries. Where possible, wastes generated during both the construction and operational phases will be managed in accordance with the waste hierarchy of (in decreasing order of priority) minimisation, re-use, recycling, reprocessing and disposal. The strategy for dealing with construction waste will be to:

» Appropriate planning of work activities to minimising wastes;

» Re-use of waste within the corridor, e.g., excess/waste formation materials to be used on batters to flatten them and mitigate erosion, hard core for maintenance access roads;

» Stockpile at site for storage and/or future use in other locations (sleepers, rail, concrete posts, etc.);

» Burning off construction waste such as timber (relevant permits to be obtained prior to any burning); and

» Disposal of all remaining waste to be taken to appropriate dumps/ transfer stations.

In meeting the above principles QR is committed to implementing the following practices:

» Inclusion of waste minimisation goals in contract(s);

» Encouragement of waste minimisation in purchasing including the return of packaging and palettes;

» Maximise re-use of timber and concrete waste streams;

» Recycle all recyclable waste streams; and

» Minimise the volume of wastes requiring disposal to landfill.

For construction and operational phases each potential waste stream will be identify along with appropriate waste management strategies and procedures. These strategies and procedures should be based on the waste hierarchy.

Waste disposal and recycling facilities will be provided on site by licensed, commercial operator/s. The Environmental Manager's Representative will provide educational materials information and signage on-site.

Waste Contractors will be engaged to manage, remove, and report monthly on the waste in accordance with the contract requirements. The applicable Waste Contractors are required to keep records of waste inspection and disposal, and regular inspections of litter.

Waste Contractors must ensure that no additional harm is caused to the environment due to their operations, and that they observe noise minimisation which may be relevant whilst travelling or working near the general public or landowners.

Overall the potential impacts associated with waste management are considered to be moderate. With the implementation of the requirements of this section and the EMP waste related impacts are unlikely.

4.9.2.1 Summary of Commitments

A summary of the waste management measures is provided below.

Management commitments
37. QR will address issues regarding waste management by developing a Waste Management Plan and implementing the EMP – Waste Management as outlined in Section 5 of the EIS.

4.10 Traffic, Transport and Access Arrangements

This section analyses the transport impacts during the construction of the NML and the transport operations of coal haulage along the rail line in operation. In particular the following are addressed:

- Construction Transport Methods and Routes;
- Coal Haulage;
- Potential Construction Transport Impacts and Mitigation Measures; and
- Operational Transport Impacts and Mitigation Measures.

It should be noted that a Road Impact Assessment (RIA) report and an assessment of the ten year horizon as would normally be required by the Department of Main Roads (DMR) for development assessments has not been prepared for the following reasons:

- It is expected that the NML will only generate traffic during its construction, and once constructed:
  - Any increase in vehicle numbers in the area will be generated by mining activity and as such impacts of additional vehicle numbers beyond construction of the NML should be considered separately under these projects.

It should be noted however, that DMR's Road Impact Assessment guidelines have been used for assessing the impact of construction traffic.

More detail including finalising traffic volumes related to the construction of the rail link should be included in a Traffic Management Plan that is to be prepared further to this study.

4.10.1 Construction transport methods and routes

4.10.1.1 Transport Routes

The following routes are proposed for the delivery of equipment, materials and for workforce transportation:

From Mackay/Brisbane

- Bruce Highway;
- Peaks Downs Highway;
- Suttor Developmental Road;
- Cerito-Elphinstone Road (via Glenden);
- Wollombi Road; and
- North Goonyella Mine Road (Private)

From Bowen/Townsville

- Bruce Highway;
- Bowen Developmental Road; and
- Cerito-Elphinstone Road (via Cerito Village).

All road-based transport will be via these designated routes.

As described above, Figure 4-25 shows the proposed origins and destinations and the preferred haulage routes for construction materials and equipment to and from the construction site. All of the proposed haulage routes are on state controlled roads.

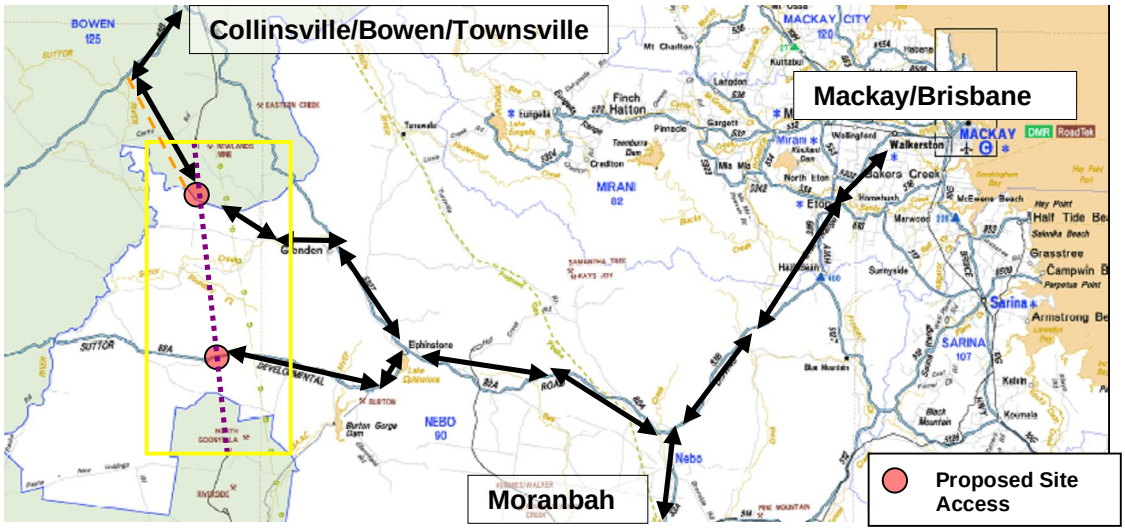

Figure 4-25 Proposed Transport Routes

In addition to the routes shown on Figure 4-25, haulage of ballast materials may be undertaken between the Euri Creek quarry and QR rail depot at Pring via the Bruce Highway and Bowen Developmental Road.

4.10.1.2 Existing Traffic Volumes

Existing traffic volume data for the main transport routes has been obtained from the DMR. Table 33 summarises the traffic data and shows a high percentage of heavy vehicle traffic on all the links that have been identified as key haulage routes. The growth in heavy vehicles is generally larger than the growth of general AADT (Annual Average Daily Traffic).

Table 33 Existing and Future Traffic Volumes

Road	Segment	Year of Count	Two Way AADT	% Heavy Vehicles	Growth	
					AADT	Heavy Vehicles
Nebo-Mackay Road (Peaks Down Highway)	Retreat Hotel	2004	2429	15.3%	8.8%	13.29%
Nebo-Mt Coolon (Suttor Developmental Road)	Nebo-Elphinstone	2004	751	19.9%	10.23%	13.29%
	West of Isaac River Bridge	2004	270	22.4%	4.29%	8.12%
	Concrete floodway West of North Goonyella	2004	61	31.6%	25.87%	22.84%

Road	Segment	Year of Count	Two Way AADT	% Heavy Vehicles	Growth	
					AADT	Heavy Vehicles
Collinsville-Elphinstone Road	North Glenden Mine to concrete floodway	2004	102	18.0%	0.19%	26.44%
	South of Isaac River	2004	435	16.8%	5.14%	7.06%
Bowen Developmental Road	North of Collinsville-Elphinstone Road	2004	328	n/a	Negative growth	n/a
	North of Cerito-Elphinstone Road	2004	120	n/a	2.76	n/a
	South of Cerito-Elphinstone Road	2004	51	n/a	7.55	n/a
Bruce Highway	North of Bowen Developmental Road	2004	4,036	15.6%	3.64%	n/a

4.10.1.3 Transport methods and volumes to be transported

Table 34 provides a summary of the volumes and tonnage of material to be transported during construction phase of the rail corridor. It should be noted that these quantities are indicative only and are based on preliminary design and are subject to variation pending completion of detailed design.

Table 34 Summary major materials required for construction

Description	Estimated Quantities*
Formation Works – Excavation	2,711,300 m^3
Formation Works – General Fill	2,391,800 m^3
Formation Works - Verge Materials	244,300 m^3
Formation Works - Top 600 Capping Layer	392,500 m^3
60 kg Rail	9,640 tonnes
60 kg turnouts (including bearers)	700 tonnes

Description	Estimated Quantities*
Concrete Sleepers	33,900 tonnes
Ballast	195,250 m^3
Concrete for bridges & box culverts	6850 m^3
Reinforcement for bridges and box culverts	1400 tonnes
Corrugated metal pipe culverts	225 tonnes
Electric traction distribution masts	1400 units
Electric traction distribution wires	450 km
Electric traction transformers & switchgear units	12 units

Hazardous or dangerous material that may be transported

The following hazardous or dangerous materials may be transported during construction of the rail corridor:

- Fuel and oil;
- Gas cylinders (for welding);
- Sewage disposal;
- Chemicals (for cleaning, etc.);
- Curing compounds, epoxy compounds; and
- Cement.

Based on the geotechnical investigations undertaken to date along the preferred alignment, it is considered unlikely that explosives will be required for blasting rock in cuttings and as such these materials have not been included in this list. This will be confirmed with further detailed geo-technical investigations, should explosives be required then appropriate safety procedures will be followed.

Over-dimension or excess mass loads that may be transported

The following over dimension or excess mass loads materials may be transported during construction of the rail corridor:

- Scrapers;
- Dozers;
- Dump trucks;
- Pile rigs;
- Batch plants;
- Prefabricated offices and accommodation; and

» Rollers;

» Bridge girders;

» Paving machines (for processed capping layer);

» Transformers / electrification cables[28].

Proposed Methods of Transport

Table 35 provides an outlined of the proposed method of transport for all construction martials to the construction site

Table 35 Proposed method of transport for construction materials

Material	Mode of Transport	Vehicles to be used	Origin	Destination
Formation materials (including general fill, capping and verge materials)	Haul/access road within corridor	Excavators, dozers, dump trucks	Site	Site
Steel Rails	Rail	Specially fabricated rail sets from Banyo to site	Banyo	Site
Concrete Sleepers	Rail	Freight trains	Rockhampton	Site
Ballast	Road / rail	By road from quarry to rail loading point and by ballast trains to site	Pring - other potential sources being considered (to be confirmed after further geotechnical investigations)	Site
Fuel	Road	Fuel tankers	Mackay / Bowen	Site
Concrete girders	Road	Semi Trailers	Rockhampton / Townsville	Site
Concrete			Batch plant on site	Site
Steel reinforcing	Road	Semi trailers	Mackay/Tville	Site
Cement	Road	Trucks / semi trailers	Gladstone	Site
Concrete	Road	Trucks	Local quarry	Site

[28] Based on current projections, electrification of the rail link is expected to be implemented only by 2018 or later.

Material	Mode of Transport	Vehicles to be used	Origin	Destination
aggregates				
Sand backfill	Road	Trucks	Local quarry	Site
Capping material (if not available on site)	Haul road	Dumptrucks	Local quarry	Site
Construction waste			Stockpiled on site	
Cleared timber/vegetation			Re-spread onsite, excess to the burnt on site (permits to be obtained)	
Construction camps, supplies, consumables	Road	Trucks / semi-trailers	Rockhampton/ Mackay/ Townsville	Site
Sewage	Road	Specialist trucks (Cleanaway (or similar))	Site	Council dump point
Box and CMP culverts	Road	Semi trailers	Rockhampton / Mackay / Townsville	Site
Electric traction distribution materials (masts, wire, fittings)	Road or rail to distribution points then road or rail to site	Various trucks up to 10m, or rail wagons or light road/rail vehicles, road or rail boring machines – to be determined	Brisbane	Site
Site Electric traction Power Systems equipment (transformers, switchgear etc).	Road	Low loader, crane	Brisbane	Site

4.10.1.4 Construction traffic

Number and type of workforce traffic and service vehicles

The following is an estimation of the numbers and types of construction vehicles to be used during the construction phase:

Construction vehicles

- 8 Tip trucks,
- 8 dump trucks;
- 6 rollers;
- 12 dozers;
- 12 scrapers;
- 8 excavators;
- 2 paving machines (for processed capping layer);
- 8 graders;
- 4 cranes;
- 6 backhoes;
- 2 - 4 pile rigs;
- 2 batch plants; and
- 6 water carts

It should be noted that these are **estimates** only. Actual type and number of vehicles is to be determined by the contractor.

Supervision / Service vehicles

- 4 Fuel trucks;
- 30 4WD vehicles;
- 6 passenger cars; and
- 4 vans.

It should be noted that these are **estimates** only. Actual type and number of vehicles is to be determined by the contractor.

Anticipated number of construction related trips

The following is an estimate of the number of road trips to be generated on state and local government controlled roads during the construction phase of the project. These numbers are based on construction related tasks and do not include the trips to be generated by construction personnel accessing the site or visiting nearby towns.

- Light vehicles: approximately 150 / day initially reduced to 30 when continuous access throughout along the alignment is established early during the construction period.
- Heavy vehicles: approximately 15 / day, higher during the establishment period.

It is anticipated that some workforce personnel will pool transport arrangements, with the majority to be transported by buses.

Ballast Haulage Related Trips

Should ballast material be sourced from the Euri Creek Quarry then haulage will be via the Bruce Highway to Pring (a distance of approximately 25 km). The total volume of ballast at this stage has been identified as 195, 250 sqm. This equates to a total of approximately 24 two-way trips per day.

Expected construction workforce movements

Construction camp/s will be established along the alignment. These camps will accommodate the majority of the construction personnel. Therefore it is expected that only a limited number of construction staff are anticipated to travel from Moranbah and Collinsville. Camps will be established at a road / rail intersection in the north and/or south end of the site (such as off the Suttor Developmental Road and the Cerito-Elphinstone Road).

Work will generally be confined to daylight hours and therefore minimal communing to occur at night.

Timing and duration of construction transport

Throughout the 18-24 month construction period transport along the designated routes will occur daily. It is envisaged that major construction items will leave the construction site approximately three months prior to completion of the rail link.

The haulage of ballast is expected to be completed within a six-month period.

4.10.1.5 Trip Generation and Distribution during Construction

The trip generation, distribution and relevant analysis has assumed an 18-24 month construction period, north to south construction and three key access locations, as shown on the corresponding figures.

Four phases of construction have been assumed for trip generation and distribution purposes. They have been labelled A, B, C and D for ease of reference. Phases A and D are concerned with the establishment and dissolution of the construction sites at the northern and southern end of the rail line respectively. These phases are expected to be brief and have been assumed to last only 30 days and 15 days for the establishment and dissolution of the site respectively. Phase B refers to the general construction of the northern portion of the line with the primary access for workers and vehicles to be from Cerito-Elphinstone Road. Phase C refers to the general construction of the southern portion of the line with primary access to be gained from Suttor Developmental Road. Table 36 below summarises the staging used and the assumptions made to assess potential traffic impacts.

Table 36 Construction Traffic Scenarios

Phase	A	B	C	D
Period Description	Site Establishment	Normal Construction Period		Site Dissolution
Primary Access	Northern		Southern	
Assumed Construction Periods	18 months (546 days)			
	30 days	501 days		15 days
Anticipated Traffic Generation				

Phase	A	B	C	D
Heavy Vehicles	20vpd	15vpd	15vpd	20vpd
Light Vehicles	150vpd	30vpd	30vpd	150vpd
Total Vehicles	170vpd	45vpd	45vpd	170vpd

vpd – vehicles per day

The table shows an anticipated peak daily traffic generation of 150 light vehicles and 20 heavy vehicles. It should be noted that the peak periods of construction-generated traffic are only expected to be for a short period of time (up to 30 days) and hence the real impact of construction traffic on the road network should be considered as the general construction period. This normal construction period (approximately 500 days) volume estimate has been used to assess any capacity impacts on road segments and also intersections. The pavement impact assessment takes into account all phases and periods of construction to include the total number of construction related ESAs (Equivalent Standard Axles).

Figure 4-26 and Figure 4-27show the anticipated origins/destinations and percentages of light vehicle and heavy vehicle traffic respectively for what has been described as the construction phase of the project. These percentages have been used in all subsequent calculations and are believed to be adequate for this particular level of planning.

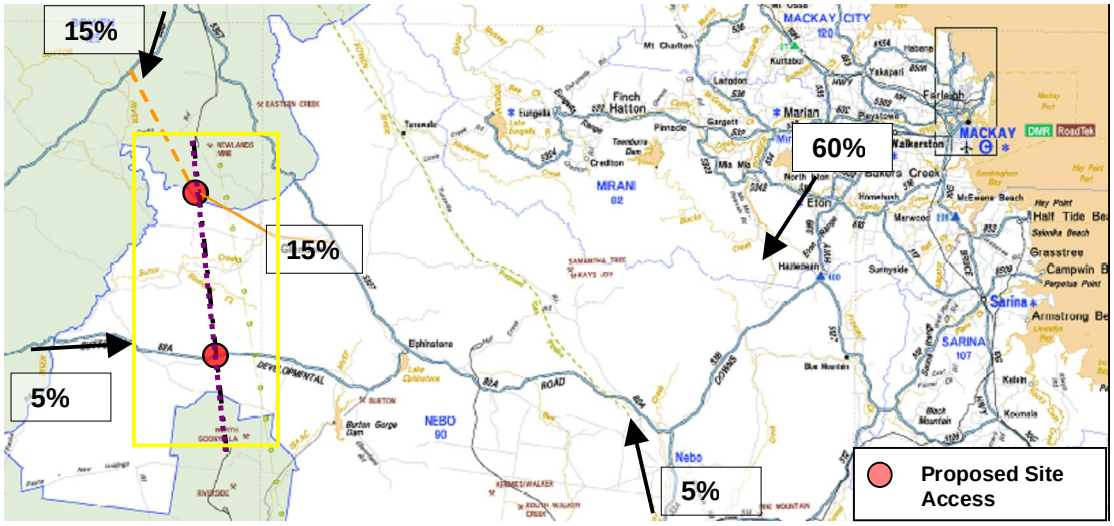

Figure 4-26 Light Vehicle Trip Distribution

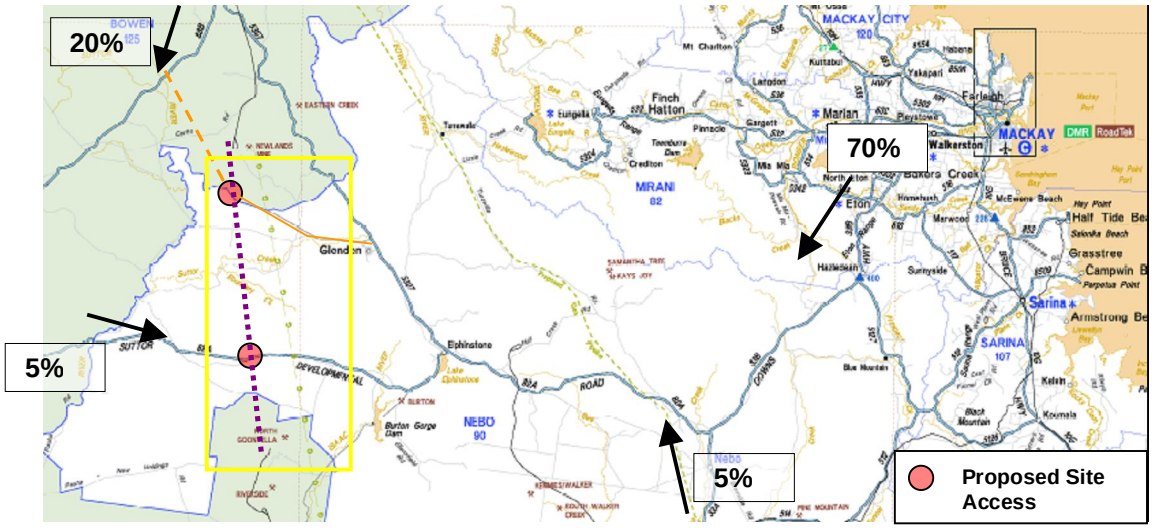

Figure 4-27 Heavy Vehicle Trip Distribution

Further, more detailed construction traffic generation and distributions should be refined in a Traffic Management Plan when more detail is available relating to workforce population, sourcing of materials and construction programming and timing.

4.10.1.6 Existing roads along alignment and access requirements

The rail corridor will cross over two publicly controlled roads, the Suttor Developmental Road and the newly constructed Cerito-Elphinstone Road.

The Suttor Developmental Road is presently an unsealed gravel road at the point of the rail crossing and had an average traffic count of 61 vehicles/day in 2004.

The new Cerito-Elphinstone Road is currently being constructed and no traffic counts are available, however it is expected to have heavy usage due to the Newlands Mine and the new capability for the public to travel north from Glenden to Bowen via a sealed road (currently this route is via unsealed dry weather roads).

The project will require the construction of a maintenance track running the length of the link within the rail corridor. With the exception of the maintenance track, no new access requirements from State or local government roads to the rail corridor are envisaged for this project. Existing access via the Suttor Developmental Road and the new Cerito-Elphinstone road will serve as the major access roads. Initially, however, some additional access paths may need to be negotiated with landowners to obtain access into site of the contractor needs them.

4.10.2 Coal Haulage

Expected volumes and growth of coal haulage along the NML is shown in Table 37. In the first year of commissioning, coal haulage is predicted to be 3 Mtpa, with an increase to 10 Mtpa by year 12 and an ultimate volume of 35 Mtpa by year 17 and beyond.

Table 37 Coal Haulage Volumes

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Future
Average number of train services per day	5	8	7	7	9	9	9	7	7	7	7	8	13	17	17	20	22	29
Forecast Volume of Coal (Mtpa)	3	5	6	6	7	7	7	8	8	9	9	10	16	21	20	24	27	35
	Commission Stage 1A							Commission Stage 1B					Commission Stage 2			Commission Stage 3		

Note: Forecast coal volumes carried across the Link for any year may vary significantly depending on actual coal demand, coal contracts entered into by individual mines, and port and rail capacity. A mix of short trains and a long train is likely to be used in Stage 1A, commencing with only short trains. Timing for the introduction of a longer train may vary depending on operational requirements.

Train numbers have been based on a conservative 269-day year and an average maximum trainload of 9700 net tonnes. Trains that will operate along the rail link will be approximately 2.0 km long (Goonyella sized trains). Trains could operate over a 365-day year, 24 hours per day in all weather conditions, provided the rail line remains open and clear of debris (i.e. not during flooding events).

4.10.3 Potential construction transport impacts and mitigation measures

4.10.3.1 Potential impacts

Potential transport impacts due to the construction phase of the project include the increased demand on roads, deterioration of road pavement, intersection level of service, increases in travel times and impacts to private roads

As discussed previously, access from the state-controlled network exists at the proposed access locations. The assessment of any warrants for the upgrading of intersection/access forms as a result of construction related traffic should be undertaken in the Traffic Management Plan in accordance with published DMR guidelines. This section outlines the need or otherwise to undertake these further assessments. The impact of construction traffic has been considered for intersections and road segments and has been summarised below in Table 38 and Table 39 respectively.

Outside of the immediate study area, the transportation of ballast from Euri Creek Quarry to Pring Rail depot will be undertaken on DMR controlled roads of Bruce Highway and Bowen Developmental Road. This haulage route has also been analysed with the anticipated impact outlined in Table 38 and Table 39. As discussed previously, transportation of the ballast has been assumed to occur over a six-month period creating on average 24 two-way trips per day.

Calculations and assumptions are provided in Appendix L.

Traffic Safety Impacts and Mitigation Strategies

In regards to road safety and the addition of heavy vehicle construction traffic, the current traffic data obtained from DMR shows a relatively large component of existing traffic consists of heavy vehicles. Given the existing large proportion of heavy vehicles, the impact of heavy vehicles related to the construction during the construction of the project would have minimal impact. It is only during the initial and final phases (A and D) that numbers of heavy vehicles may increase significantly as illustrated in Table 36 however this would only be for a short period of time and it is expected that no further traffic management measures would be required, during this period.

Capacity Analysis

The capacity analysis has been undertaken to determine if the addition of construction related traffic results in an increase in total traffic of more than 5%. If these levels are exceeded, then the impact is considered to be significant by DMR and will require further detailed consideration. As illustrated in Table 38 there is an increase in traffic at each of the subject intersections during the construction of the project, particularly the during the initial and final phases. However as stated above these periods are quite short and the real impact on traffic levels that should be considered

would come from the normal, lengthier construction periods (Phases B and C). Background traffic volumes at the intersections and the road segments have been assessed as 2008 AADT (Annual Average Daily Traffic) calculated using existing (2004 and 2005) traffic volumes and growth rates.

Table 38 Traffic Impact by Intersection

Intersection	Construction Stage	Total Background Daily Traffic	Total Construction Related Traffic	% Impact
Suttor Developmental /Collinsville – Elphinstone Roads	Site Establishment (2007)	1,788	459	26%
	Normal Construction (2008)	1,898	139* (Stage 2a)	7.3%
	Site Closing (2009)	2,010	531	26%
Collinsville – Elphinstone /Newlands Mine Roads	Site Establishment (2007)	1,057	414	39%
	Normal Construction (2008)	1,100	113* (Stage 1b)	10.3%
	Site Closing (2009)	1,144	126	11%
Mackay – Nebo/Suttor Developmental Roads	Site Establishment (2007)	6,172	450	7.3%
	Normal Construction (2008)	6,611	123	1.9%
	Site Closing (2009)	7,049	450	6.4%
Bruce Highway/Bowen Developmental Road	Normal Construction (2008)	11,380	48	<1%

* Critical stage for maximum traffic volumes through intersection during normal construction.

The analysis shows that with the Mackay – Nebo Road/Suttor Developmental Road intersection does not exceed 5% of the existing traffic during the normal construction period. The following

intersections will require further, detailed traffic analysis as part of the detailed design phase of the project:

» Suttor Developmental /Collinsville – Elphinstone Roads (7.3 % increase);

» Collinsville – Elphinstone /Newlands Mine Roads (10.3 % increase).

Table 39 shows the impact of construction related traffic on the road segments of interest.

Table 39 Traffic Impact by Road Segment

Road Segment	Background AADT (2008)	Estimated Construction Traffic Volume (vpd)	Critical Construction Period	% Impact
1	3,284	58	Both	1.8%
2	2,269	6	Both	0.3%
3	1,058	64	Both	6.0%
4	316	64	Southern Access	20.3%
5	524	56	Northern Access	10.7%
6	124	64	Southern Access	51.6%
7	473	64	Northern Access	13.5%
8	124	18	Southern Access	14.5%
9	126	16	Both	12.7%
10	83	14	Southern Access	16.9%
11	345	16	Both	4.6%
Bruce Highway	4,624	24	N/A	<1%
Bowen Develop-mental Road	1,730	24	N/A	1.4%

The majority of road segments analysed are showing that construction traffic will contribute more than 5% of the existing daily traffic volumes during the construction period. These road segments

will require further, detailed impact analysis in the Traffic Management Plan. It should be noted that it is expected that there is sufficient spare capacity within the existing road layout and intersections that capacity will not be an issue.

For the haulage of ballast shown as the road segments of the Bruce Highway and Bowen Developmental Road, the estimated construction traffic accounts for less than 2% of the total traffic on both road segments.

Pavement Impact Scoping

A pavement impact scoping assessment has been undertaken to determine the likely magnitude of the impact of construction traffic on key links in the road network. The assessment identifies road segments that are likely to be impacted significantly by the introduction of construction traffic over the entire construction period. It should be noted that this assessment has been undertaken for scoping purposes and uses high-level assumptions for distributions, traffic volumes and ESA loadings. Therefore the impact on certain road sections may vary with the provision of more detailed information and this should be considered together with any potential bring forward costs at a later stage.

Figure 4-28 shows the locations of the road segments for which the scoping analysis has been undertaken.

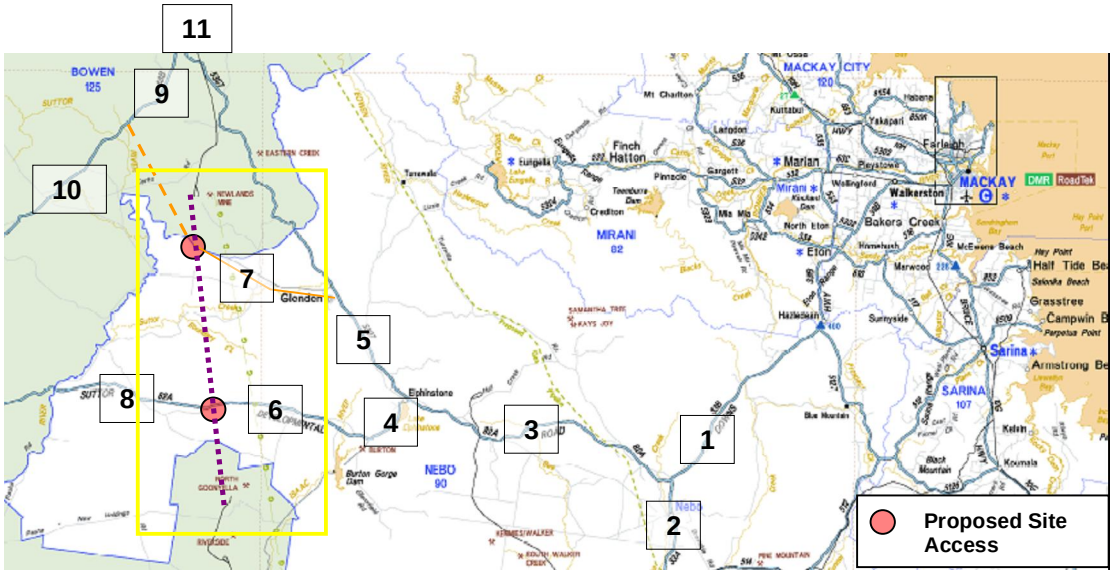

Figure 4-28 Location of Road Segments Analysed

Table 40 shows the background ESAs and construction traffic ESAs for the entire project period. The background ESAs have been calculated for the entire 18-24 month construction period based on 2008 AADT background heavy vehicle volumes. Construction traffic ESAs have been established using the traffic generation and distribution assumptions described in Section 4.10.1.5. Average ESA loadings have been assumed for construction traffic.

Table 40 Pavement Impact Scoping Summary

Road Segment	Background Traffic ESAs	Construction Traffic ESAs	% Impact
1	900,900	65,139	6.7%
2	622,440	4,653	0.7%
3	400,764	69,792	14.8%
4	139,776	33,665	19.4%
5	163,800	36,127	18.1%
6	64,428	33,665	34.3%
7	146,328	36,127	19.8%
8	64,428	2,244	3.4%
9	77,825	18,611	19.3%
10	33,076	8,977	21.3%
11	103,194	18,611	15.3%
Bruce Highway[1]	755,550	19,786	2.6%
Bowen Developmental Road[1]	333,610	19,786	5.6%

[1] these segments are associated with ballast haulage between Euri Creek Quarry and Pring

Table 40 shows that the impact of the construction traffic on Mackay – Nebo Road (Peaks Down Highway) and Bowen Developmental Road (north of Collinsville – Elphinstone Road) is not likely to have a significant impact given that the proportionate impact is around 5%. The calculation of the pavement impact and any potential rehabilitation bring forward costs will not be required at these locations.

For the remaining proposed transport routes the increase in construction traffic will be greater than 5% of background ESAs and further more detailed pavement impact assessment will need to be undertaken during the detailed design phase, particularly when the volume of construction materials, source of materials, and staging and length of the construction period is more finite.

The impact of increased background traffic due to the construction of the Cerito – Elphinstone Road, particularly on segment 9 shown in Figure 4-28 has not been considered in this assessment. With the addition of background traffic, it would be expected that the impact of the construction traffic would decrease to below 18.2% where it currently exists.

Traffic Management Plan

QR is to ensure that Construction Contractor will prepare and implement a Traffic Management Plan. This plan is to be based on discussions with DMR and local councils and including information on the following:

- Provision of sufficient and suitable signage advising the presence of the Construction Site and any areas with restricted access.
- Provision of detailed road haulage routes to and from site for all stages of the construction and the management and maintenance of those routes.
- Provision of adequate signage identifying and warning of impending construction access at temporary access locations.
- Full assessment of proposed access locations to construction site in line with DMR standards to identify any potential intersection upgrades that may warrant turning lanes, signage, line marking and/or lighting.
- Full assessment and identification of any amelioration of road sections and intersections identified within this section as contributing to more than 5% of the existing traffic volumes. Amelioration may include but is not limited to additional turn lanes, road capacity including overtaking lanes, line marking or lighting.
- A haulage management plan should be prepared to ensure that haulage occurs on approved routes only.
- Provision of suitable temporary vehicle wash down points where Parthenium or other noxious weeds are present (such as at the construction camp/s, main access point onto the private property.
- Provision of regular use of water carts or sealing of access where close to residence to minimise dust generation.

4.10.3.2 Strategies for road management

The following strategies/management actions will be implemented during the construction phase to minimise and manage the impacts of construction machinery and personnel to the local road network.

Management Commitment
Pre-construction
38. QR will develop a Transport and Traffic Pre-Construction agreement in consultation with the local councils and the Department of Main Roads to address issues pertaining to construction traffic and associated maintenance and repair of council and DMR roads during the construction phase. This may include undertaking additional pavement and intersection assessments if these are required.
Construction
39. Continuous liaison between QR and local council/DMR throughout the construction phase

Management Commitment
through the setting up of a dedicated road Committee with members from the Contractor, QR, local residences, local council staff and DMR.
40. QR is to ensure that Construction Contractor will prepare and implement a Traffic Management Plan.

4.10.4 Operational transport impacts and mitigation measures

The assessment on operation impacts of the rail corridor on road crossings was undertaken using software (ALCAM) developed by QT and now adopted Australia wide. The scoring is determined by the software with input being a response to a series of standard questions. These inputs include information pertaining to protection details, road geometry, road traffic control, road vehicles, rail vehicles, crossing geometry and visibility. Risk scores are determined based on existing and proposed characteristics and controls. The installation limit, an assessment as to whether the proposed works will result in the crossing conforming to Australian Standard 1742.7 Manual of Uniform Traffic Control Devices – Rail Crossings, is then determined and the level of crossing protection confirmed.

4.10.4.1 Details of adjacent roads

The NML alignment will cross two public roads, Suttor Development Road and Cerito-Elphinstone Road. The Suttor Developmental Road is state-controlled road and is the main connection between the villages of Mount Coolon and Elphinstone. It is a two lane gravel road that transverses east to west. The Cerito-Elphinstone Road is currently under construction, and will be completed by the time the rail line is operational. This road will connect the village of Cerito to Glenden via a sealed road.

4.10.4.2 Proposed crossings for Suttor Developmental Road and Cerito-Elphinstone Road

A preliminary risk assessment carried out for the Suttor Development Road crossing using the ALCAM software has determined that flashing lights will provide the crossing with more than an adequate level of protection. This will be reconfirmed in due course with additional assessments in the detailed design stage. It is to be noted that there are existing crossings in Queensland with much greater traffic volumes than this one that are protected with flashing lights and boom gates. It is also proposed to provide one at-grade cattle crossing at this location.

Queensland DMR is in the process of constructing the Cerito-Elphinstone Road. This new road connects the road from Newlands Mine (the main connection from the mines to Glenden) to the village of Cerito. It is expected the traffic on this road will be relatively heavy at selected times, and therefore grade separation has been proposed. Hence, an allowance has been made for a road over Rail Bridge in the design and costing. A risk assessment to determine the required level of protection will be required as part of the detailed design.

At both these crossing locations the maintenance access track will need to cross these public roads. For these intersections the required horizontal and vertical intersection sight distance for vehicles approaching the intersection from any direction will be achieved and also there may be a

requirement for minor intersection treatment that would enhance the safety for any turning/crossing vehicles and also minimise impact on through traffic.

4.10.4.3 Strategies to assess downstream effects

The following provides on outline of the strategies proposed to assess and manage road/rail interfaces at downstream locations on the rail network when operational capacity of the NML increases.

It needs be recognised that the key driver for both the additional road and rail traffic in the region is increased mining activity. Future EIS for new and upgrading of mines needs to pay additional attention to this aspect.

As the full scope of the NML project will be implemented in three stages with Stage 1 further sub-divided into two (Stages 1A, 1B, 2 & 3), the level of protection for downstream crossings at each stage will be reviewed using the ALCAM model and determined in conjunction with Queensland Transport, Department of Main Roads (for public roads) and local councils for council roads using agreed strategy. It is proposed for the road authority, QR and Queensland Transport to work jointly together to address these issues with QT taking the lead role given its umbrella portfolio responsibilities. In addition, the proposed joint authority review above will investigate options for current and future road/rail conflict issues to be addressed with industry at an early stage.

The road - rail interface issue at Bruce Highway – Abbot Point road junction and the proximity of the rail crossing to the Bruce Highway will be investigated through a separate joint-study by QR and Queensland Ports Corp (not part of this EIS). The study will focus on both long-term and short-term traffic issues at the crossings over the various construction phases of both rail and port expansions and appropriate mitigation measures will be developed and implemented in consultation with the Department of main Roads and Queensland Transport.

4.10.4.4 Changes to road traffic patterns

Once the rail link is operational, there are no envisaged changes to the existing road patterns within the project area and surrounding region.

4.10.4.5 Summary of operational management commitments

Management commitments
41. Strategies for the assessment and management of downstream impacts to road/rail crossings will be undertaken in conjunction with Queensland Transport, Department of Main Roads (for state controlled roads) and local councils for council roads.
42. A separate assessment of the road / rail traffic interface issues at the Bruce Highway – Abbot Point road junction will be undertaken jointly by QR and Queensland PortsCorp and appropriate mitigation measures determined in consultation with DMR and QT.

4.11 Hazard and Risk

4.11.1 Risk Assessment

Table 41 provides a profile of historical accidents and incidents that have occurred in the previous five years on QR coal network between years 2001 and 2005. Table 42 provides a projected annual accident/incident rate over the NML. Given the high numbers of level crossing across the QR coal network and the comparatively lower number of crossings on the link, as well as the low traffic volume in the study area, this equates to a low potential occurrence of train/vehicle collisions as a result of the rail link.

The majority of the train derailments that occur within the network are as a result of the loading and unloading of coal as opposed to the transport of coal. The Goonyella system experiences derailment incidents from loaded coal trains travelling down steep coastal ranges into Mackay. Within the previous five years there have been no derailment incidents within the Newland system.

Table 41 QR System-wide Coal Haul Accident Profile Rating

Obstruction Type	Average Number of accidents /incidents per km per year						
	Accidents			Safety Incidents **			Total
	Collision	Derailment	Others	Collision	Derailment	Others	
Level Crossings							
Livestock							
Motor Vehicles / Cyclists / Pedestrians	0.001			0.007			0.008
Others...	0.001						0.001
On Track							
Livestock	0.017			0.037			0.053
Motor Vehicles / Cyclists / Pedestrians				0.004			0.004
Others...	0.010	0.003		0.003			0.015
Yard / Sidings							
Livestock							
Motor Vehicles / Cyclists / Pedestrians							
Others...	0.006	0.031		0.001			0.038
Other Areas							
Livestock							

Obstruction Type	Average Number of accidents /incidents per km per year						
	Accidents			Safety Incidents **			Total
	Collision	Derailment	Others	Collision	Derailment	Others	
Motor Vehicles / Cyclists / Pedestrians							
Others...		0.001					0.001
Total number / track km / year	**0.034**	**0.034**		**0.051**			**0.120**

Accident Profile worked out based on estimated track haul length of 2040 km* and record of incidents over 5 year period.

* Approximate only. Does not include passing loops and yard sidings.

** These include Near-Miss incidents, potential safety situations,

... Others include objects on track, natural obstructions, other animals, other rollingstocks, etc.

Table 42 Projected Annual Number of Accident/Incident for the Northern Missing Link (69 km *)

Obstruction Type	Average Number of accidents /incidents per year						
	Accidents			Safety Incidents **			Total
	Collision	Derailment	Others	Collision	Derailment	Others	
Level Crossings							
Livestock							
Motor Vehicles / Cyclists / Pedestrians	0.068			0.467			0.534
Others...	0.054						0.054
On Track							

Obstruction Type	Average Number of accidents /incidents per year						
	Accidents			Safety Incidents **			Total
	Collision	Derailment	Others	Collision	Derailment	Others	
Livestock	1.157			2.530			3.687
Motor Vehicles / Cyclists / Pedestrians				0.298			0.298
Others...	0.656	0.189		0.210			1.055
Yard / Sidings							
Livestock							
Motor Vehicles / Cyclists / Pedestrians							
Others...	0***	0***		0***			0.000
Other Areas							
Livestock							
Motor Vehicles / Cyclists / Pedestrians							
Others...		0.041					0.041
Total number / year	**1.935**	**0.230**		**3.504**			**5.669**

Accident/incident rates worked out based on QR systemwide profile given above.

* Approximate only. Does not include passing loops.

** These include Near-Miss incidents, potential safety situations,

*** These are taken as zero as there are no yards / sidings planned to be constructed on the missing link.

... Others include objects on track, natural obstructions, other animals, other rollingstocks, etc.

4.11.1.1 Risk Assessment

A risk assessment was undertaken during the planning stage of the project in accordance with QR Standard: GEN/STD/1400/RMT Risk Management. This assessment identifies hazards, causes, likelihoods/consequence of risk and provides mitigation measures to reduce the risk occurrence.

Using the likelihood /consequence severity criteria a matrix is developed to assess the qualitative risk to the environment from potential impacts. Risks levels include:

- Extreme – Intolerable environmental risk with significant and urgent actions required to reduce the risk;
- High and Medium – Implement actions necessary to reduce risk to As Low As Reasonably Practicable (ALARP), within the EMP; and
- Low – Monitor and manage risk to the extent necessary.

A summary of the risk assessment results will be updated into the EMP for this project.

Table 43 outlines a preliminary risk assessment undertaken during the planning stage of the project.

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Table 43 Risk Assessment – Planning

Risk / Hazard	Causes	Consequences	Likelihood of Occurrence before treatment	Consequence of Risk before treatment	Risk before treatment	Treatment Measure	Likelihood of Occurrence after treatment	Consequence of Risk after treatment	Risk after treatment	Responsibility
Spillage of Hazardous chemicals & materials	Accidents, derailment of trains	Contamination of soil and/or water, destruction of flora, fauna	Low	High	Medium	Contractor to develop a construction safety and environmental management plan to be reviewed and approved by QR before implementation. The EMP will include all the construction commitments made in this EIS. QR to develop hazard management procedures in line with QR standard SAF/STD/0004/WHS: Management of hazardous Substances and lead Hazardous Substances QR standard SAF/STD/0008/COM Emergency Preparedness, Response and Recovery to be used as the basis for consequence management.	Low	Medium	Low-medium	Contractor QR
Construction vehicle on public / private access road		Accidents leading to damage to public / private property and risk of injury/fatality to people	Low	High	Medium - high	Contractor to develop a construction safety management plan to be reviewed and approved by QR before implementation. The EMP will include all the construction commitments made in this EIS. Provision of occupational crossings / bridges to landowners for access across track	Low	Medium-high	Low-medium	Contractor / QR

Risk / Hazard	Causes	Consequences	Likelihood of Occurrence before treatment	Consequence of Risk before treatment	Risk before treatment	Treatment Measure	Likelihood of Occurrence after treatment	Consequence of Risk after treatment	Risk after treatment	Responsibility
Cattle on rail Corridor	Cattle straying into rail corridor	Accidents leading to injury / death to cattle due to construction vehicles / equipment	Medium	Medium	Medium	Fencing to be erected all through the acquired corridor prior to construction commencement and access / entry points to be controlled with gates	Low	Low - medium	Low	Contractor
						Contractor and landowners to agree on appropriate procedures for facilitating crossing of corridor				Contractor
Fire	Construction activities and fuel explosion	Widespread damage to adjoining property, flora and fauna	Low	Medium	Medium	Contractor to develop a construction safety management plan to be reviewed and approved by QR before implementation. The EMP will include all the construction commitments made in this EIS.	Low	Medium	Low - medium	Contractor
						QR to adopt established regular corridor maintenance procedures for maintaining vegetation within corridor				QR
						Agree on procedures with landowners on maintaining fire breaks, etc prior to implementation and operations				QR

Risk / Hazard	Causes	Consequences	Likelihood of Occurrence before treatment	Consequence of Risk before treatment	Risk before treatment	Treatment Measure	Likelihood of Occurrence after treatment	Consequence of Risk after treatment	Risk after treatment	Responsibility
Noxious Weeds	Inadequate control measures in place during construction and operation	Widespread growth and transfer of weeds to neighbouring properties affecting grazing	Medium	Medium	Medium	Contractor to develop Environmental Management Plan to be reviewed and accepted by QR prior to construction. The EMP will include all the construction commitments made in this EIS.	Low	Low - medium	Low	Contractor / QR
						QR to reach agreement with landowners on weed management prior to implementation and operations				QR
						QR to control weeds and weed spreads within corridor through regular corridor vegetation maintenance and appropriate clean down practices				QR

Risk / Hazard	Causes	Consequences	Likelihood of Occurrence before treatment	Consequence of Risk before treatment	Risk before treatment	Treatment Measure	Likelihood of Occurrence after treatment	Consequence of Risk after treatment	Risk after treatment	Responsibility
Erosion & Flood Damage	Inadequate protection works during construction and maintenance work during operations	Sustained damage to vegetation, creeks, adjoining properties, etc	Medium	Medium	Medium	Providing adequate design standard at design phase through establishing appropriate design criteria. The design will include all the construction commitments made in this EIS. Maintaining appropriate temporary drainage and other protection works during construction – covered through standard contract conditions, work specifications and best practice guidelines / manuals Regular corridor inspections and maintenance works during operations phase using established inspection procedures	Low	Medium	Low - medium	QR Contractor QR
Cultural Heritage Artefacts	Uncoordinated construction activity	Damage to CH artefacts	Medium	Medium	Medium	Develop Cultural heritage management Plan to be adopted during construction phase Use of Cultural heritage monitors during clearing works at commencement of contract	Low	Low - medium	Low	QR Contractor

Risk / Hazard	Causes	Consequences	Likelihood of Occurrence before treatment	Consequence of Risk before treatment	Risk before treatment	Treatment Measure	Likelihood of Occurrence after treatment	Consequence of Risk after treatment	Risk after treatment	Responsibility
Flora & Fauna	Construction activities – e.g., clearing works	Widespread and/or sustained damage to endangered / threatened / rare or vulnerable species of flora and fauna	Medium	Medium	Medium	Contractor to develop Environmental Management Plan to be reviewed and accepted by QR prior to construction. The EMP will include all the construction commitments made in this EIS. Limit clearance of vegetation to extent of earthworks including haul & maintenance roads and land use requirements for corridor maintenance and management of safety issues	Low	Medium	Low-medium	Contractor QR / Contractor
	Train Operations	Sensitive fauna pathways are dissected by the corridor	Low	Medium	Medium	Planning and design to identify and design adequate protection measures e.g. fauna access tunnels	Low	Low	Low	QR
Road / Rail Intersection	Construction of new rail link crossing existing roads	Accidents leading to injury/death to persons, damage to road vehicles and trains	Low	High	Medium-high	Conduct safety risk assessment, use appropriate safety control devices and/or grade separation	Low	Medium - high	Low - high	QR

Risk / Hazard	Causes	Consequences	Likelihood of Occurrence before treatment	Consequence of Risk before treatment	Risk before treatment	Treatment Measure	Likelihood of Occurrence after treatment	Consequence of Risk after treatment	Risk after treatment	Responsibility
Coal spillage	Derailment, Train operations	Large scale (e.g. majority of wagons spilling) in a low sensitive (such as within the corridor) environment	Low	Medium	Medium	Train operators to develop an Environmental Investigation & Risk Management Report (EIRMR) as part of the Access Agreement process. This will need to be accepted by QR prior to operations. Notify/liaise with local EPA staff about such environmental incidents and any necessary cleanup.	Low	Low - medium	Low - medium	Train Operator/QR QR
Dust pollution	Construction activities	Dust generation and nuisance to residences along the alignment	Medium	Medium	Medium	Contractor to employ dust mitigation methods such as regular watering of construction access roads during dry and windy periods	Low	Low	Low	Contractor
Fuel / Oil / Chemical Storage	Construction requirement	Contamination of land / water and risk of injury / fatality to people	Low - medium	High	Medium - high	Contractor to develop a construction safety management plan to be reviewed and approved by QR before implementation	Low	Medium	Low - medium	Contractor
Noise	Construction activities and Train operations	Nuisance to residences along the alignment	Low	Low	Low	Noise levels during construction are considered as nuisance levels. No mitigation proposed Noise levels during operation are calculated to be well below EPA guidelines	Low	Low	Low	Contractor

Risk / Hazard	Causes	Consequences	Likelihood of Occurrence before treatment	Consequence of Risk before treatment	Risk before treatment	Treatment Measure	Likelihood of Occurrence after treatment	Consequence of Risk after treatment	Risk after treatment	Responsibility
Construction Workplace Accidents	Blasting, earthmoving, heavy lifting, trenches, equipment, tools, work practices	Risk of personal injury / fatality	Medium	High	Medium - high	Contractor to develop a construction safety management plan to be reviewed and approved by QR before implementation	Low	Low	Low	Contractor
Pedestrian / Rail alignment interface	Most of the track to remain "unsupervised"	Risk of injury / fatality to people	Low	High	Medium - high	Whole of rail corridor is to be fenced with well defined occupational and public crossings Consultation with residents along the alignment and education of their children on rail safety	Low	Medium - high	Low - medium	QR QR

Notes:

'As implemented' likelihoods and consequences mean the proposed rail infrastructure constructed with the management commitments / nominated management actions listed in chapter 6 of the EIS.

For decommissioning stage the corridor will be returned to QT as per lease conditions

QR will adopt appropriate design standards and maintenance procedures to minimise the likelihood of derailments and other hazards

NML corridor has a lower level of risk when compared with other coal line haul sections in that it has fewer number of level/occupational crossings.

The information contained in Table 43 shows that the risk profile for the proposed NML is generally Low to Medium for the risks assessed. Generally these risks are common to all "Greenfield" track construction in which QR has adequate and appropriate experience with the Bauhinia Rail Link being the most recent example of similar coal line haul construction. There are no identified "Extreme" or "High" risks to track construction, persons or the environment.

4.11.2 Emergency Management Plan

QR have a series of Emergency Management Plans for the construction and operation of rail corridors that will be implemented during the construction and operation phases of the project during emergencies, these include:

- Emergency Management - Master Contents.
- Emergency Management – General Requirements.
- Level Crossing Emergency.
- Person Hit by Train.
- Overhead Line Equipment Emergency.
- Passenger Door Emergency.
- Derailment.
- Collision.
- Threats.
- Evacuation of Trains.
- Fires
- Defective Rollingstock & Unsafe Loads.
- Track Obstructions.
- A Signal Passed at Danger.
- Wrong Side Signal Failure.
- Dangerous Goods Emergency.
- Serious Injury or Illness on Trains.
- Environmental Emergency.
- Emergency Management – Requirements for Train Crew.
- On-site Management Procedures.

The following strategies will be implemented during the construction phase:

- Dangerous goods shall be stored, handled and signed as per AS-1940 and relevant legislation.
- Material Safety Data Sheets (MSDS) shall be located at the Site Office for all hazardous and dangerous goods stored and used during construction.
- Spills of hazardous materials or hydrocarbons or will be contained and collected for treatment at a licensed waste disposal facility.
- Spill containment and treatment equipment and materials shall be available near storage areas of hazardous materials and hydrocarbons.

4.11.2.1 Involvement of State Emergency Services

It will be the responsibility of the construction contractor to liase with the relevant State agencies (including the Queensland Ambulance Service, Queensland Fire Bridge and Queensland Police Service) to develop plans for emergency medical response, fire fighting and first aid matters. These plans are prepared prior to construction commencing and are to include at least the following information:

- Contact details for the Regional Fire Brigade, Ambulance Service, Australian Flying Doctors, Queensland Police Stations at Collinsville, Glenden and Moranbah;
- Names and contact details for project first aid officer, safety officer and Construction Manager;
- Location of first aid point and first officer;

- Designated transport routes;
- Identification of air fields and potential helicopter pads in the area; and
- Location and type of fire fighting equipment available on site.

4.11.3 Summary of Commitments

A summary of the management actions QR has committed to complete is provided below.

Management commitments
Pre-construction
43. Undertaking a detailed and project specific risk assessment as part of the rail Construction Safety Management Plan. This is to be prepared in accordance with appropriate parts of *AS/NZS Risk Management Standard 4360:1999* and the main QR risk assessment standards.
44. Development of contingency plans for hydrocarbon spills based on QR policy and strategies, including use of Material Safety Data Sheets (MSDS), storage of hydrocarbons as per relevant legislation, provision of suitable spills kits and treatment of contaminated material.
45. Development of contingency plans for natural disasters based on QR policy and strategies.
46. Implementation of QR Emergency Management Plans for the construction and operation of rail corridors.
Operation
47. Undertaking a detailed and project specific risk assessment prior to commissioning and operation of the rail link. This is to be prepared in accordance with appropriate parts of *AS/NZS Risk Management Standard 4360:1999* and the main QR risk assessment standards.

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5. Environmental Management Plan

5.1 Introduction

Draft Environmental Management Plans (EMPs) have been prepared for the construction and operation phases of the project. The aim of these EMPs is to provide a framework for the control, mitigation, monitoring, reporting and auditing necessary to prevent or ameliorate potentially adverse environmental effects.

Audits and reviews of the EMPs are to be undertaken after finalisation of detailed design, completion of project specific risk assessment and appointment of construction contractor and the relevant EMP is to be updated and made more specific.

5.1.1 Context of the Environmental Management Plans

These EMPs (Construction and Operation) have been written at the preliminary design stage of the project and are therefore focussed on practical solutions and guidelines to assist project designers reduce the environmental effects identified in the EIS. More detailed information is to be included when it becomes available.

The Project Manager will have ultimate responsibility for the implementation of the EMPs however the requirement(s) to implement the relevant components of each EMP should be included in all contracts for design, construction, operation and management of the link including the access road.

5.1.2 Objective of the Environmental Management Plans

The objective of these EMPs is to provide an agreed minimum environmental standard and actions for the Construction Contractor and Operational Manager to undertake the site works.

The implementation of the EMPs provides assurance to the community and Regulatory Authorities, including the Belyando, Nebo and Bowen Shire Councils, that the works will be undertaken in a suitable environmental manner.

5.2 Environmental Management Processes and Responsibility

QR is committed to safeguarding aspects of the environment that may be affected during the planning, design, construction and maintenance phases of the NML project. The following roles and responsibilities relates to their obligations under the *Environmental Protection* Act 1994.

Principal (QR)	The Principal has responsibilities extending through the planning and design of this Project and ultimately through to construction and operation of the facilities to the end of the defects liability periods. The Principal may delegate certain responsibilities.
Project Manager	The Principal shall engage a Project Manager to deliver the Project. The Project Manager has responsibilities extending through the planning, design, construction and operation of the facilities to the end of the defects liability period.

Design Consultants	Organisations or individuals engaged by the Principal to undertake any aspect of the planning or design of the project. This includes any sub-consultants.
Superintendent	Organisations or individuals appointed by the Principal to carry out Superintendent Services for the construction of the project.
Construction Contractors	Organisations or individuals engaged by the Principal to undertake the construction of the project. Sub-contractors may include private contractors, local government and the like.
Project Staff	This includes the Principal, Project Manager, Design Consultants, Superintendent, Construction Contractors and any sub-contractors and sub-consultants engaged by any of the above in relation to the project.
Environmental Officers (EO)	Individuals engaged by the Design Consultants and Construction Contractor for the duration of the design and construction activities respectively associated with the project. The EO's shall be responsible for monitoring the Environmental Design Report (EDR) and EMP (Construction) by the Design Consultants and Construction Contractors and their sub-consultants and sub-contractors.
Community Liaison Officer (CLO)	Individual engaged by the Construction Contractor for the duration of construction activities associated with the project. The CLO shall be responsible for registering community complaints and ensuring that they are attended to, implementing procedures to handle the media and organising any public notifications.

5.2.1 General Responsibilities of All Staff

All project staff have a general environmental duty under section 319 of the *Environmental Protection* Act 1994. Project staff must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm.

Section 320 states that if project staff, while performing their work, notice that serious or material environmental harm is being caused or threatened by their actions or the actions of someone else, they should then report the matter.

Project staff will also be required to comply with the following at all times:

» Relevant environmental legislation;

» EMPs; and

» Training requirements.

The following sections provide the responsibilities and accountabilities of various parties who will have active roles in the environmental management of the project. The responsibilities have been divided into the various project stages of design, construction and operation.

5.2.1.1 Design Consultants

Responsibilities of the Design Consultants include:

- Performing a detailed review of the final planning layout to ensure the functionality and appropriateness of the design, and compliance to the required minimum standards;
- Reporting on the functionality of the final planning layouts, together with providing recommendations for amendments to the layouts where appropriate, and a cost implications statement;
- Performing the detailed design of the project and incorporating the requirements of the EMP in these designs;
- Performing a safety audit;
- Reporting on methods of construction;
- Performing an assessment of the Constructability of the design and providing necessary amendments to the design in order to improve Constructability, giving consideration to:
  - incorporation of and compliance with the EMP;
  - achieving detailed design timetable;
  - preparing an EDR to demonstrate the integration of environmental issues in the design phase;
  - managing any sub-consultants used in the detailed design; and
  - preparing a risk management strategy for each and every actionable and auditable commitment.

5.2.1.2 Construction Contractor

Responsibilities of the Construction Contractor include:

- Creating an approved site specific EMP (Construction) in accordance with the requirements stated in this EMP and the requirements of regulatory authorities;
- Obtaining all necessary statutory approvals and consents;
- Ensuring compliance with approvals and consents;
- Seeking advice from appropriately qualified environmental scientist/engineer who is familiar with and has a working knowledge of the requirements of the *Environmental Protection Act 1994* and associated Environmental Protection Policies;
- Implementing environmental protection measures as described in the approved EMP (Construction);
- Providing copies of the EMP (Construction) to each sub-contractor with responsibilities under the plan;
- Ensuring the full and complete implementation of the EMP (Construction) by sub-contractors;
- Ensuring that requirements of the EMP (Construction) are complied with by sub-contractors;
- Auditing sub-contractors implementation of the EMP (Construction) and adherence to the requirements of the assessment study and their quality systems;
- Establishing monitoring programs to test performance criteria and standards;
- Monitoring and reporting on the performance of environmental protection measures in accordance with the requirements of the EMP (Construction);

- Identifying (during monitoring) and reporting to the Superintendent any non-conformances to the EMP (Construction) and corrective actions implemented;
- Managing corrective actions arising from monitoring activities and external audits;
- Providing regular reports to the Superintendent; and
- Reviewing the EMP (Construction) implementation and effectiveness.

5.3 Environmental Training of Personnel

The Principal and the Project Manager shall ensure that all staff with responsibilities under this EMP have received environmental awareness training. This will be addressed by the requirement that the Design and Construction Managers will ensure that all employees (including consultants, sub-consultants, contractors and sub-contractors) have received appropriate environmental training about the relevant EMPs (Construction, Operation) and have an understanding of the EMPs. The Managers will also ensure that all employees have an understanding of their own responsibilities and those of the environmental operating guidelines relevant to each Manager.

The EMP (Construction) and EMP (Operation) will detail procedures to identify the needs for all employees (including sub-consultants, contractors, sub-contractors and visitors). Each will receive environmental training about the relevant EMP.

General environmental training will be a requirement of working on the project and will comprise the following:

- General Induction for all – introduction to the project and assigned tasks in regard to the EMP, including:
  - Environmental policy;
  - Objectives and targets of the EMP;
  - Mitigation measures;
  - Organisational structure and roles and responsibilities;
  - Communication and notification; and
  - Monitoring and reporting requirements.
- Site Specific – tailored to actual site and job description to allow personnel to complete assigned tasks in regard to the EMP;
- Task Orientated Training – given ‘on the job’ and focussed on specific activities e.g. emergency response, oil spill contingency; and
- External Training – particular courses offered e.g. Weed Management for wash down to certify vehicles.

The *Construction Contractor* will receive training in relation to:

- Their general environmental duties under the *Environmental Protection Act 1994*;
- The specific environmental requirements of the EMP;
- Their responsibilities under the assessment study and EMP in relation to the construction of the rail line, in relation to the EMP (Construction), implementing performance criteria, monitoring, reporting and implementing corrective actions;

- Their responsibilities in an environmental incident;
- The consequences of not implementing performance criteria or departure from specified operating conditions;
- Internal and external communications practices; and
- Document control.

Environmental training for on-site staff could be performed during the site specific safety induction. Any further environmental training could be performed on an ongoing or periodic basis.

5.4 Auditing

The Project Manager will audit the Construction Contractor's implementation of the EMP (Construction). The Construction Contractor is responsible for all impacts on-site until completion of the Defects Liability Period. This will be done to ensure that works being undertaken comply with the assessment study and this EMP. The frequency of the audits will depend upon the activities being undertaken, but at least cover commencement and close out of the construction phase and periodic audits where appropriate (eg non-compliance or every 12 weeks should construction period be extended). Any changes to this frequency will be authorised by the Principal. An audit report would be issued within 2 weeks and distributed to the Principal, Construction Contractors and if necessary, to any relevant authorities.

Actions to be undertaken by the Project Manager during the audit are likely to include:

- Checking monitoring program and reporting procedures;
- Undertaking investigations where necessary;
- Reviewing performance standards and criteria against results;
- Preparing audit reports over time (with respect to agreed schedule) and submitting them to the Principal; and
- Ensuring procedures for non-compliance and exceedance/investigation/ intervention indicators are clearly identified.

The Superintendent shall be responsible for managing all necessary auditing of the Construction Contractors during the construction phase. The Superintendent shall prepare a strategic audit program to monitor the Construction Contractor's implementation of the EMP (Construction) and adherence to the requirements of this EMP and the Construction Contractor's Quality System.

Actions to be undertaken by the Superintendent during the audit are likely to include:

- Checking the monitoring program and reporting procedures;
- Reviewing performance standards and criteria against results; and
- Preparing audit reports over time (with respect to agreed schedule) and submitting these to the Principal.

5.5 Monitoring and Reporting under the EMP

Section 320 of the *Environmental Protection Act 1994* requires that any person, who becomes aware of an event that may or has caused environmental harm, must report the event/incident to their employer. This will be emphasised during training.

Monitoring and reporting provides a direct measure of the project's impacts, consequences of its operations and efficiency of the EMP. This includes:

» Monitoring of implementation of EMP (Construction);

» Regular inspection of construction activities against performance criteria;

» Environmental monitoring of impacts over time i.e. photo-monitoring and audits; and

» Reporting and analysis of discharges, emissions and waste disposal (where regulations required).

5.6 Non-conformance and Corrective Action

Any non-conformances (including valid complaints) with the requirements of the EMP shall be identified by the EO. Appropriate corrective actions shall be identified and implemented to ensure the non-conformance does not re-occur. The non-conformance identified and the corrective action taken shall be reported in the monthly report.

5.6.1 Review and Update

The Proponent and the Construction Contractor will review, and if necessary, amend the EMP as often as required until construction is completed.

Reviews will take into consideration:

» Changes in legislation;

» Results of reviews and audits;

» Complaints;

» Environmental incidents;

» Penalties, notices, prosecutions and other legal actions;

» Improvements in procedures, equipment, materials; and

» Other relevant environmental issues.

5.7 Statutory & Other Requirements

Through this EIS and EMP the Proponent will give due consideration to the likely environmental impacts of the project under various Commonwealth, state and local government legislation, guidelines and policy. This section includes a description of current documents and guidelines relevant to environmental management of the project. It is noted however, that these will require reviewing at the time of commencement of design, construction and operation given the rapid rate of change in environmental legislation and guidelines in Queensland.

» *Environmental Protection Act 1994*;

  – *Environmental Protection Regulation 1998*;
  – *Environmental Protection (Waste) Policy 2000*;
  – *Environmental Protection (Waste) Regulation 2000*;
  – *Environmental Protection (Water) Policy 1997*;
  – *Environmental Protection (Noise) Policy 1997*;

  - *Environmental Protection (Air) Policy 1997*; and
  - *Environmental Protection Amendment Regulations (No. 2) 1999*.
- *National Environment Protection Council (NEPC) Act 1994;*
- *National Environment Protection Measure (NEPM) (Implementation) Act 1998*;
- *Integrated Planning Act 1997*;
- *Transport Infrastructure Act 1994*;
- *Environment Protection Biodiversity and Conservation Act, 1999* (Commonwealth)
- *Nature Conservation Act 1992*;
- *Plant Protection Act 1989*;
  - *Plant Protection Regulations 1990*;
- *Queensland Heritage Act 1992*;
- *Aboriginal Cultural Heritage Act 2003*;
- IEAust Engineering Guidelines for Queensland Construction Sites: Soil Erosion and Sediment Control 1996;
- Environmental Protection Agency Guidelines including, but not limited to:
  - Contaminated Lands: Draft Guide for the Assessment and Management of Contaminated Land in Queensland;
  - Preparation Guidelines for Environmental Management Plans; and
  - Terrestrial Flora and Fauna Survey Guidelines.
- Building (Flammable & Combustible Liquids) Regulations 1994;
  - AS 1940-1993 The Storage and Handling of Flammable and Combustible Liquids.
- Soil Erosion and Sediment Control - Engineering Guidelines for Queensland Construction Sites (IEAUST)
- AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites.
- AS 1940-1993 The Storage and Handling of Flammable and Combustible Liquids
- Environmental Protection Agency Practice Note 8.0 to the User's Guide (April, 1998) - Assessment of Unreasonable Noise
- AS 1055-1997 Acoustics - Description and Measurement of Environmental Noise
- AS 2670 Evaluation of Human Exposure to Whole-Body Vibration
- Policy Standards and Guidelines - Public Consultation the Better Way to Make Decisions
- Australian and New Zealand Environment and Conservation Council. (ANZECC) and Agriculture Resource Management Council of Australia and New Zealand (ARMCANZ). (2000). Australian and New Zealand Water Quality Guidelines for Fresh and Marine Waters.

5.8 Draft Environmental Management Plans

The following draft EMPs for Construction and Operation have been developed to address particular environmental issues relevant to the project during the construction and operation phases. The EMPs

aim to provide criteria and indicators to measure the environmental performance of the project, as well as mitigation controls to reduce potential impacts. Audits and reviews of the EMPs are to be undertaken and the EMPs are to be made more specific on finalisation of detailed design, completion of project specific risk assessment and appointment of construction contractor and finalisation of construction methodology.

The objectives of the mitigation measures in relation to eliminating or reducing impacts are included below.

Preferred ↓ **Less Preferred**	**Avoid**	Activities that could cause adverse impacts
	Prevent	Measures that impede the occurrence of negative impacts
	Preserve	Preventing future actions that may negatively impact a resource or attribute
	Minimise	Limiting or reducing the degree of an impact
	Rehabilitate	Repairing or enhancing affected areas
	Restore	Restoring an affected resource to how it was prior to the impact
	Compensate	Create or enhance a resource to compensate for what is lost

The mitigation measures include 'performance indicators' which can be reviewed to indicate whether it's been achieved.

5.8.1 Draft Environmental Management Plan (Construction)

The draft EMP (Construction) includes the following elements:

Erosion and Sediment Management	Water Quality
Clearing and grading	Flora and Fauna Protection
Weed Management	Bushfire Prevention Management
Noise and Vibration Management	Air Quality Management
Traffic Management	Waste Management
Handling and Disposing of Dangerous Goods	Clean-up and Rehabilitation

A draft CHMP has been prepared for the project. This is provided in Appendix H.

A Risk Management Plan will be prepared during the construction phase of the project.

5.8.1.1 Erosion and Sediment Control	
Potential Impacts	» Degradation and loss of soil » Modification of existing drainage patterns » Sedimentation of water courses
Responsibility	Construction Manager
Performance Objectives	» Minimise soil loss and degradation. » Minimise modification of existing drainage patterns. » Reduce the risk of sediment flow to watercourses
Management Actions	» Where practicable construction will take place in dry season. » Instruct all site workers in the implementation and management of erosion control measures and drivers to minimise damage to the local environment. » Restrict the area of vegetation and soil disturbance during the construction works to the smallest possible areas. » Demarcation of approved clearing areas. » Where possible, existing access tracks are to be used to avoid creation of new ground and soil instability problems. » Sediment or silt barriers such as sand bags and straw bales (not containing weed seeds) shall be used where required. » Erosion control structures shall be installed in the following areas: – Down slope of disturbed soil; – Around soil stockpiles; and – At discharge point from construction sites and roads. » Soil and construction stockpiles shall be placed away from drainage lines or stormwater paths. » Stormwater runoff shall be managed to minimise the potential for erosion including diverting flow over stable areas and away from disturbed areas. » The condition of erosion/stormwater control structures shall be periodically checked during construction, especially after rainfall to ensure they remain effective e.g. berms, silt fences, turn-off drains. » Uncontaminated sediment is to be removed from all sediment control devices and incorporated in fill batters or mounds on site. Contaminated sediment shall be disposed of to an approved stockpile area of disposal area. » Works undertaken in floodplain areas shall be constructed at a low profile so that natural flood flow is not impeded, such as the Suttor Creek floodplain. » The period for which the soil is left open to erosion shall be minimised. » Removal (as required) of sediment build-up from sediment basins and other

5.8.1.1 Erosion and Sediment Control	
	devices. » Areas where construction or site works have been completed shall be stabilised and rehabilitated within at least one week of completion. » Access to recently revegetated areas shall be restricted to allow for new vegetation to become established. » Permanent (restored) batters shall have topsoil spread evenly and shall then undergo hydraulic seeding/mulching (hydro-mulching) (see Section 6.8.12). This includes down slope fill batters, if these have been cleared of vegetation even if parts of these are almost flat. » Sites are to be re-contoured to a stable form that resembles the surrounding landscape.
Performance Indicators	» Transportation of sediment offsite » Over-disturbance of soils within construction site » Reinstatement of water courses to original contours with erosion controls. » Sedimentation has been limited off corridor to as low as reasonably practical. » Erosion control measures are reviewed and maintained regularly.
Monitoring/Reporting	» During construction, works will be regularly inspected to access the implementation of Management Actions. » Weekly or post-event inspections of erosion and sediment control devices for efficient operation. » Monitoring of revegetation progress and soil stabilisation. » Daily or weekly reports (as appropriate) shall be completed on site and reviewed by each Supervisor and/or Superintendent. » Regular reports will be prepared by the Construction Contractor in a format agreed to by the proponent, detailing the location of any soil erosion and sediment control structures and corrective actions undertaken in the event of exceeding performance criteria.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and complied within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale.
Associated Documents	» Approved soil erosion drawings » *Soil Erosion and Sediment Control-Engineering Guidelines for Queensland Construction Sites (1996)*

5.8.1.2 Water Quality	
Potential Impacts	Degradation of watercourses, reduced water quality and detrimental impacts to riparian ecosystems
Responsibility	Construction Manager
Performance Objectives	» Minimise the impact on water quality and riparian ecosystems. » Minimise impacts to aquatic fauna. » Avoid the spread of weeds.
Management Actions	» Culvert structures are to be designed to accommodate a 1 in 50 year flow event. » Bridge structures for the three main creek crossings (Kennedy, Eaglefield and Suttor creeks) to be designed to AS:5100 STANDARD. » Construction within waterways, especially Suttor Creek to be scheduled, as far as possible, during dry season. » Where heavy rains or floods are predicted, work will cease and the site shall be made as stable as practical. » Any waste, concrete washings or similar construction materials shall be disposed of in bunded areas for containment and treatment. » All fuel, chemicals and other hazardous materials that may be kept on site are therefore required to be stored in bunded or sealed areas at least 100m away from waterways, drainage lines and farm dams to avoid spillage and contamination of water. » All vehicles and equipment should be maintained in accordance with manufacturers recommendations and checked regularly for possible fuel, oil and chemical leaks. » The use of fertilisers during revegetation works at the site shall be the minimum necessary to promote establishment and shall be incorporated to minimise the likelihood of fertiliser being carried offsite to watercourses. » Treated effluent discharge to be positioned away from drainage lines and sewage system regularly maintained by a licensed operator. .
Performance Indicators	» Sediment laden down stream water quality » Run-off of contaminated water
Monitoring/Reporting	» During construction, the works will be regularly inspected to assess the implementation of Management Actions. » Receiving waters water quality as per regulations and conditions. » Daily or weekly (as appropriate) shall be completed on site and reviewed by

5.8.1.2 Water Quality	
	each Supervisor and/or Superintendent.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale.
Associated Documents	» Approved design drawings » *Soil Erosion and Sediment Control-Engineering Guidelines for Queensland Construction Sites (1996)*

5.8.1.3 Clearing and Grading	
Potential Impacts	» Soil disturbance » Loss of habitat
Responsibility	Construction Manager
Performance Objectives	» Minimise disturbance of flora and fauna habitats. » Avoid adverse impacts to potential cultural and European heritage sites. » Optimise the success of vegetation rehabilitation. » Minimise soil erosion and degradation. » Minimise the risk of weeds spreading. » Minimise impact on visual amenity. » Minimise disruption to landholders and third parties.
Management Action	» Prior to clearing, collection of seeds from local native trees for propagation and use in seed mixes, in particular the seeds of the vulnerable *Dichanthium queenslandicum.* » Clearing is to be restricted to the minimum necessary to enable the safe construction, operation and maintenance of the railway line including associated infrastructure (firebreaks, access track, construction haul roads). » All vegetation to be removed is clearly marked and clearing contractors briefed on clearing requirements. » No clearing of remnant vegetation (including the Bluegrass grasslands) for access tracks, temporary workspace or construction site office. » Cleared vegetation or soil is not to be pushed up against trees or stored against fence lines. » Erosion control measures will be installed where appropriate to minimise topsoil loss (refer to EMP for Erosion and Sediment Control) » Topsoil will be stored away from gully areas and above the potential water flow line. » Topsoil shall be removed first and stockpiled separately during excavations to aid in re-establishing adequate vegetative cover. » Topsoil stockpiles shall be kept free of debris such as stumps and surface rock, which make topsoil re-spreading difficult. » Topsoil lost due to erosion or contamination shall be replaced with topsoil that is of the same soil type. » Permanent fencing to be installed following clearing of vegetation and

5.8.1.3 Clearing and Grading	
	before commencing construction work. » Where possible cleared vegetation is to be mulched and used in rehabilitation activities, the remaining vegetation is to be burned in a controlled manner.
Performance Indicators	» Topsoil and vegetation has been removed and stored appropriately to allow for successful reinstatement. » No damage to flora and fauna outside the construction from unapproved or unplanned vegetation clearing. » Erosion control measures installed during clear and grade. » Compliance with the CHMP in regard to monitoring during clear and grade.
Monitoring / Reporting	» During construction, the corridor and associated work areas will be regularly inspected to access the implementation of Management Actions » Regular audits in accordance with the EMP, with implementation of the recommendations and corrective actions. » Daily or Weekly reports (as appropriate) shall be completed on site and reviewed by each Construction Manager or Superintendent.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and complied within the Complaints Register. » Incident or non-compliance corrective action shall be closed out by the Construction Manager according to an agreed responsibility and timescale.
Associated Documents	» Approved construction alignment drawings

5.8.1.4 Flora and Fauna Protection	
Potential Impacts	» Death or injury of native fauna. » Loss of significant vegetation, including habitat trees.
Responsibility	Construction Manager
Performance Objectives	» To minimise the impacts of construction and clearing.
Management Actions	» Construction sites, such as site office, soil stockpiles, machinery/equipment storage and construction camp are to be located within existing cleared and degraded areas. There is to be no placement of construction sites in the Bluegrass grasslands in the northern section of the corridor. » Demarcation of approved clearing areas. » Construction Contractor shall ensure that the area to be cleared is clearly delineated by bright flagging tape or fence and that impact on flora and fauna is minimised. » Mature, hollow-bearing trees along Suttor Creek are to be retained far as practicable for safety issues; » Compliance with the Weed Management Plan » During vegetation clearing, care shall be taken to ensure that native fauna is not harmed (including snakes). » Use of a fauna catcher prior to and during land clearing to pin point habitat trees and if required aid in relocation of animals. » Large hollows bearing trees are to flagged and remain intact after clearing. These trees are to be placed under bridges to provide habitat. » Provision of culverts within gilgaied landscaped to allow uninterrupted surface flows across landscape and allow small fauna such as frogs and snakes, especially the Ornamental Snake the ability to cross beneath the rail corridor.
Performance Indicators	» Clearing beyond the required limits. » Presence of weeds within site area. » Loss of hollows and/or habitats.
Monitoring/Reporting	» During construction, work sites will be regularly inspected to assess the implementation of Management Actions. » Monitoring of weed infestations along the corridor will be conducted following construction for the duration of the maintenance period of the contract.

5.8.1.4 Flora and Fauna Protection	
	» Daily or weekly reports (as appropriate) shall be completed on site and reviewed by each Supervisor and/or Superintendent. » Photo-monitoring of selected sites will be instigated prior to construction and continue through the construction period. These sites will be photographed on a regular basis and collated into a Site Photo Register.
Corrective Action	» Immediate revegetation of areas outside delineated work zones. » Replacement of hollows destroyed and relocation of them to other areas onsite not disturbed by clearing activities.

5.8.1.5 Weed Management	
Potential Impacts	Introduction and spread of weed species
Responsibility	Construction Manager
Performance Objectives	To prevent the introduction and spread of Declared Plants and environmental weeds.
Management Actions	» A Weed Management Plan (WMP) is to be prepared and approved prior construction commencing. The WMP is to contain the following: *Washdown and Hygiene Procedures* » Temporary weed washdown bays are to be established at the construction camp and construction site office. All onsite personnel will follow these weed hygiene procedures: » Prior to arrival at the project area, all vehicles, equipment and portable infrastructure (including trailers, generators, workshop and accommodation huts etc) will be washed down (spray-cleaned). » Cleaning procedures need to remove soil and organic matter from the surface of vehicles, equipment and portable infrastructure, including undercarriage and running gear. » Proof of inspection, such as 'washdown tickets' from state operated facilities is required for all vehicles coming from known areas of weed infestation, before permission is granted to enter uninfected tenure areas. If the vehicle is not considered clean by a trained weed inspector, it shall be re-washed and re-inspected before certification. » A weed washdown sticker is to be placed on the windscreen of vehicles that have been certified weed free. » Vehicles and machinery certified weed free shall be noted in the Northern Missing Link Weed Register to be updated regularly and located at the Site Office. » Only approved access tracks and roads are to be used for access to the rail corridor. » Vehicles and construction equipment that has accessed the rail corridor and leaving the corridor shall be washed down upon leaving and entering. *Training* » Superintendents and supervisors will be briefed on the recognition of weeds, in particular Parthenium. *On-going Management following Rehabilitation* » The definition of a "weed" for the purposes of management is based on

5.8.1.5 Weed Management	
	that of 'environmental weed,' namely a species that by virtue of fecundity and growth habit has the potential to establish large infestations that dominate and eventually exclude the native vegetation. » Control programs to be carried out by personnel qualified in the recognition of target weeds and potential weed species. » Where possible maintain weed control over the corridor to reduce competition to new revegetation for approximately 2 years. *Parthenium Management Program* » A Parthenium Weed Management Strategy is to be developed as part of the WMP. Recommendations to control Parthenium weed is provided on the Department of Natural Resources and Mines (DNRM) web site: http://www.nrm.qld.gov.au/pests/weeds/declared_plants/parthenium.html
Performance Indicators	Introduction of weed species
Monitoring / Reporting	» During construction, work areas will be regularly inspected to assess the implementation of Management Plans. » Daily or weekly reports (as appropriate) shall be completed on site and reviewed by each Supervisor and/or Superintendent. » Any introduction of declared flora or other environmental weeds will be reported to the Construction Manager who will then notify authorities. » Photo-monitoring of selected sites will be instigated prior to construction and continue through the construction period. These sites will be photographed on a regular basis and collated into a Site Photo Register.
Corrective Action	» Investigations/corrective actions undertaken as a result of a complaint will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. » If a substantial outbreak of a declared noxious weed is found on the corridor corrective measures will be taken in accordance with the Weed Management Plan.

5.8.1.6 Bushfire Prevention	
Potential Impacts	Fire outbreak causes damage to flora and fauna, beef grazing lands, third party infrastructure or loss of life.
Responsibility	Construction Manager
Performance Objectives	To minimise the bushfire risk during railway construction and to prevent the spread of bushfire in the event of ignition.
Management Actions	» Consultation with relevant authorities shall be undertaken and compliance with all relevant fire restrictions and notification requirements shall be met. » Preparation of a Construction Fire Management Plan. » Clear all flammable materials from around fire ignition sources. » Fire extinguishers and fire fighting equipment shall be available. » All construction vehicles shall have portable fire extinguishers. » Maintenance and operation of all machinery to comply with relevant fire safety standards. » Having earthmoving machinery and water trucks shall be on stand by during construction. » Ensure all construction workforce is conversant with bushfire education and training.
Performance Indicators	Absence of bushfires
Monitoring / Reporting	» During construction, the site will be regularly inspected to assess the implementation of Management Actions. » Daily or weekly reports (as appropriate) shall be completed on site and reviewed by each supervisor and superintendent. » Superintendents will conduct regular site inspections to ensure flammable materials are stored safely and to identify and mitigate fire hazards.
Corrective Action	» Any bushfire incidents and corrective actions will be documented by the Construction Contractor and reported to the appropriate authorities as required.

5.8.1.7 Noise and Vibration	
Potential Impacts	» Exceedences of *Environmental Protection (Noise) Policy* » Complaints from residents and other sensitive receptors
Responsibility	Construction Manager
Performance Objectives	To minimise the level and time of noise disturbance.
Management Actions	» Two affected homesteads (Denham Park and Wollombi) to receive adequate notice of potential noise incursions. » Construction camps, office and maintenance site shall be located at least 1.5 km from noise sensitive areas. » Construction equipment shall be equipped with manufacturers noise abatement devices. » Noise generating equipment shall be located at appropriate distances from residences and/or will be enclosed or screened if necessary. » Noise abatement procedures will be undertaken in accordance with Section 3 of the *EPP Noise 1997.*
Performance Indicators	Receipt of a valid complaint regarding noise generated from activities associated with construction.
Monitoring / Reporting	» Regular inspections will be undertaken during construction to assess the implementation of Management Actions. » In response to noise complaints, noise monitoring will be undertaken at locations close to where the activities are occurring. In the event of a complaint, a report will be prepared by the Construction Contractor for the proponent, detailing any noise complaints during construction. » Monthly Reports to the Construction Manager.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and complied within the complaints register. Corrective activities will be closed out by senior management according to an agreed responsibility and timescale. » Complaints received about noise and will be investigated within 24 hours, and, if required, operating activities will be modified to reduce noise impacts.

5.8.1.8 Air Quality	
Potential Impacts	» Generation of vehicle and dust emissions within locality of construction. » Complaints from residents and other sensitive receptors. » Exceedances of the *Environmental Protection (Air) Policy*.
Responsibility	All employees
Performance Objectives	» Receive no complaints from local residents in relation to air emissions. » Minimise generation of dust during construction activities.
Management Actions	» Water unsealed roads and construction site during dry and windy conditions, in particular in the vicinity of the two affected residences (Denham Park and Wollombi Station) » Vehicle speeds shall be restricted to minimise dust. » Machinery and equipment shall comply with Australian standards for air emissions. » Notify potentially impacted local residents if construction may lead to excessive dust generation. » All surfaces disturbed as a result of construction activities shall be revegetated to reduce the potential for dust issues. » Soil stockpiles created during construction shall be kept to an appropriate height to minimise dust issues. » Surface binding of top-soil stockpiles (seeding with sterile grasses). » Covering of all truck loads. » Regular maintenance of unsealed haulage routes.
Performance Indicators	» Receipt of a valid complaint regarding emissions generated during construction activities. » Visual dust
Monitoring / Reporting	» During construction the rail corridor will be regularly inspected to access the implementation of the Management actions. » Daily or weekly reports (as required) shall be completed on site and reviewed by each Supervisor and/or Superintendent. » Monthly reporting and in the event of a complaint to Construction Manager.
Corrective Action	» Take action to control emissions on the construction site determined through investigations of complaints or actions from monitoring events.

5.8.1.9 Traffic Management	
Potential Impacts	» Disruption to traffic on local roads » Degradation to private, Local Council and Department of Main Roads managed roads
Responsibility	Construction Manager
Performance Objectives	» Minimise the disturbance to local traffic. » To provide a safe working environment.
Mitigation Measures	» A Traffic Management Plan is to be prepared for the project prior to construction activities commencing. » Traffic control is to be utilised during the crossing of the Suttor Developmental Road and Cerito-Elphinstone Road. » Construction traffic leaving and entering the site shall be restricted to daylight hours, where possible. » Traffic control should always be utilised if construction activities will interfere with traffic operations. » Daily toolbox meetings are to incorporate traffic management requirements. » Road works signs shall be installed during the railway construction period. » Construction workers shall wear appropriate Personal Protection Equipment (PPE) at all times i.e. fluorescent vests, hard hats etc. » Small tracks and minor farm access roads should not be used without permission from landowner. » There should be no use of un-designated roads by construction crew. » All gates are to be left in manner as found, gates are not to be left open and un-manned if numerous trips are to be undertaken. » A haulage management plan should be prepared to ensure that haulage occurs on approved routes only. » Provision of suitable temporary vehicle wash down points where Parthenium or other noxious weeds are present (such as at the construction camp/s, main access point onto the private property. » Provision of regular use of water carts or sealing of access where close to residence to minimise dust generation.
Performance Indicators	» Disruption to local traffic is minimised. » No traffic accidents as a result of construction activities. » No injuries to workers.
Monitoring /	» During construction, traffic management procedures should be regularly

5.8.1.9 Traffic Management	
Reporting	reviewed. » Regular audits in accordance with this EMP, with implementation of the recommendations and corrective actions. » Daily toolbox meetings to incorporate traffic management requirements » Daily or Weekly reports (as appropriate) shall be completed on site and reviewed by the Construction Manager.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and complied within the Complaints Register. » Incident or non-compliance corrective action shall be closed out by senior management according to an agreed responsibility and timescale.
Associated Documents	» Approved construction alignment drawing » Traffic Management Plan

5.8.1.10 Waste Management	
Potential Impacts	» Contamination of local environment » Accumulated wastes along rail corridor
Responsibility	Construction Manager
Performance Objectives	» Minimise the risk of contamination as the result of waste. » Following construction, there is no evidence of foreign waste along the railway corridor or associated sites.
Management Actions	» Non-recyclable materials/wastes (including regulated wastes are disposed of at licences landfill sites or according to Council regulations. » Techniques for management of solid non-hazardous include: – Stockpiling re-useable waste such as timber skids, pallets and drums at a suitable location for salvage; – Development of on site disposal areas conforming to regulatory authority requirements; – Collection and removal of all domestic wastes from work sites; – All waste chemicals and other toxic materials shall be stored and collected for safe transport to locations approved by regulatory authorities; – Contaminated soils (if any) shall be managed according to their concentration, leachibility and area affected and disposed of in consultation with relevant environmental protection authorities. » Hazardous wastes involved in railway construction include radiography or cleaning chemicals and waste oils, management measures include: – Managing hazardous wastes in accordance with all relevant regulatory requirements; – Radiography of railway tracks shall be performed in a manner which ensures chemicals and other associated wastes are contained and appropriately disposed of; – All waste chemicals and other toxic materials shall be stored and collected for safe transport to locations approved by regulatory authorities; – Any soil contamination shall be managed to prevent health risks to work personnel and the community in general.
Performance Indicators	» Evidence of construction waste and construction related domestic waste not contained within designated waste disposal containers.
Monitoring / Reporting	» During construction, all works areas will be regularly inspected to assess the implementation of Management actions.

5.8.1.10 Waste Management	
	» The site will be inspected regularly by the Superintendent for rubbish and litter not disposed of correctly. » Daily or weekly reports (as appropriate) shall be completed on site and reviewed by each Supervisor and/or Superintendent. » The Construction Manager will maintain material Safety Data Sheets for all potentially hazardous substances used on site. » Spills will be documented by the Construction Contractor. » Records of waste disposal will be maintained by the Construction Contractor. » Materials, wastes and spills records shall be reported to the Construction Manager. The following protocols have been established: » waste volumes will be registered including details of the type of waste collected, amounts, and where it was disposed » monthly inspections will be undertaken of waste facilities and compounds » material re-use on site will be monitored and recorded (eg topsoil, and spoil reuse) » inspection reports will be acted on immediately (where action is required) » non-conformances will be documented
Corrective Action	» Investigations/corrective actions undertaken as a result of a complaint will be documented and complied within the complaints register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. » Where complaints are made regarding any waste management strategy, the current procedures will be investigated and appropriate action be taken as required. » Where performance criteria are breached, then compliance with these criteria must be restored as soon as possible.

5.8.1.11 Handling and Disposing of Dangerous Good	
Potential Impacts	Land contamination from fuels, oils or hazardous waste.
Responsibility	Construction Manager
Performance Objectives	» Minimise the risk of spills and land contamination » Ensure all hazardous waste is disposed of appropriately.
Management Actions	» Dangerous goods shall be stored, handled and signed as per AS-1940 and relevant legislation. » Material Safety Data Sheets (MSDS) shall be located at the Site Office for all hazardous and dangerous goods stored and used during construction. » Spills of hazardous materials will be contained and collected for treatment at a licensed waste disposal facility. » Spill containment and treatment equipment and materials shall be available near storage areas of hazardous materials. » Totally enclosed containment shall be provided for all waste. » Hazardous waste that cannot be recycled must be disposed of to a licensed waste disposal facility. » All construction waste including litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials shall be removed to a licensed waste disposal facility authorised to dispose of such materials. » Stockpile reusable and recyclable products for collection or reuse. » Collect and store hazardous wastes for disposal according to the regulations e.g. timber pallets, drums, scrap metal, glass etc. » Supply recycling bins at work sites for glass, aluminium cans, paper for collection and transport to a recycling facility. » Persons handling dangerous chemicals shall wear appropriate PPE and receive appropriate training in it's use. » Fuels, lubricants and chemicals shall be stored in appropriate containment facilities, not in the vicinity of natural or built waterways or water storage areas.
Performance Indicators	» Inappropriate storage of fuel or chemicals. » Spillage of fuel or chemicals. » Inadequate or degraded materials to respond to spills. » MSDS not available for stored goods.

5.8.1.11 Handling and Disposing of Dangerous Good	
Monitoring / Reporting	» During construction, the works will be regularly inspected to assess the implementation of Management actions. » Daily or weekly reports (as appropriate) shall be completed on site and reviewed by each Supervisor and/or Superintendent.
Corrective Action	» Investigations/corrective actions undertaken as a result of complaints will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. » Construction Manager to identify sources of contamination and arrange for affected areas to be re-mediated in consultation with EPA.

5.8.1.12 Clean Up and Rehabilitation	
Responsibility	Construction Manager
Performance Objectives	» Maximise the revegetation plant survival rates above 70% » Minimise loss of vegetation and habitat. » Minimise erosion and sediment runoff. » Minimise the loss of visual amenity. » Minimise the modification of drainage patterns.
Management Actions	*General* » Minor surface roughness will be encouraged when spreading topsoil to trap water and seed. » Watercourses, terraces and levees disturbed by construction of the railway to be restored to their original contours unless shown otherwise on the construction drawings. Banks of watercourses shall be restored in a manner that will resist erosion. » Clean-up operations shall not be undertaken during adverse weather or in wet ground conditions. Such clean-up shall be re-done in order to meet the required standard of normal dry weather clean-up. » Areas where construction or site works have been finished will be stabilised and returned to original condition (i.e. grazing paddock, vegetation), no rubbish or construction materials are to remain on site. *Soil Management* » Areas affected by operations and development will be re-profiled to stable contours, re-establish surface drainage lines and other land features. » Erosion and sediment controls will be installed as necessary (refer also to EMP Erosion and Sediment Control). » Where deemed necessary a plough or scarifier shall be used to relieve any unduly compacted surfaces on project areas such as access roads, camp sites and stockpile sites. Scarifying of areas where topsoil has been conserved shall be carried out prior to replacement of topsoil. » Top soil shall be applied before hydro-mulching. *Revegetation* » Creek banks should be stabilised and re-planted with tube stock and hydro mulched immediately construction activities have finished. Sterile rapid growth grasses such as Japanese Millet or Rye Grass can be added to native seed mix to reduce potential for soil erosion (refer below). » Disturbed areas should be re-contoured to be similar to original landscape

<table>
<tr><td colspan="2">5.8.1.12 Clean Up and Rehabilitation</td></tr>
<tr><td></td><td>
» Seeds of the vulnerable Dichanthium queenslandicum to be used in rehabilitation activities within the Bluegrass grasslands located in the north of the corridor.
» Mulched vegetation is to be re-spread over cleared areas. A maintenance access track will be retained along the easement shall be left clear from the spread vegetation.
» Environmental features such as rocks and dead timber will be placed under bridges.
Hydro-Mulching
» Permanent (restored) batters, construction sites and banks shall have topsoil spread evenly and shall then undergo hydraulic seeding/mulching (hydro-mulching). This includes down slope fill batters, if these have been cleared of vegetation, even if parts of these are almost flat.
» The Contractor shall propose a hydro-mulch for the approval of the Principal's Environmental Representative.
» The components of the hydro-mulch shall be as follows:
<table>
<tr><td>Mulch</td><td>Mulched cleared vegetation</td></tr>
<tr><td>Seedstock</td><td>Primary Growth Species: Can include Winter Rye (planted in cooler months), Japanese Millet (planted in warmer months), or other appropriate seeds (Rocket Grass). To ensure seeds are STERILE
Native seeds</td></tr>
<tr><td>Binder / Stabiliser</td><td>Biodegradable, to be proposed by Contractor</td></tr>
<tr><td>Fertiliser</td><td>One suitable for native plants proposed</td></tr>
</table>
Additional
» Signs, fences or other barriers shall be installed where appropriate to prevent unauthorised easement access.
</td></tr>
<tr><td>Performance Measures</td><td>
» Land and infrastructure affected by the construction and post construction phases will be restored to its pre-disturbance status or better.
» No new weed species is introduced.
» Revegetation shall return areas to similar composition as surrounding vegetation.
» Drainage patterns returned following construction.
</td></tr>
<tr><td>Monitoring /</td><td>» To aid in evaluating the success of the rehabilitation a number of photo points</td></tr>
</table>

5.8.1.12 Clean Up and Rehabilitation	
Reporting	can be established along the easement. » Every six months for the first two years photos are to be taken to provide an indication of the survival and growth of vegetation and establishment of weeds. » Audits will be conducted in accordance with this EMP, with implementation of the recommendations and corrective actions. » Daily or Weekly reports (as appropriate) shall be completed on site and reviewed by the Construction Manager. » It is the responsibility of the Construction Manager to ensure affected landholder is approached to verify that the rehabilitation and repairs have met all their requirements.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and complied within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale. » Investigate complaints and take all steps to restore area according to land holder requirements.
Associated Documents	» Approved construction alignment drawing.

5.8.2 Draft Environmental Management Plan (Operation)

The draft EMP (Operation) includes the following elements:

Access
Soil and Ground Stability
Vegetation Management
Weed Control
Bushfire Prevention

A Risk Management Plan will be prepared during the operation phase of the project.

This EMP has been developed for particular environmental issues relevant to the on-going operational life of the railway. The plans aim to provide criteria and indicators to measure the environmental performance during the railway's life, as well as mitigation controls to reduce potential impacts.

5.8.2.1 Access	
Potential Impacts	» Detrimental impacts on residents, landholders and third parties. » Inability to access the railway for maintenance and/or repair.
Responsibility	Operations Manager
Performance Objectives	» Minimise disturbance to native flora and fauna. » Minimise impacts to residents, landholders and third parties. » Minimise impacts to soil and water.
Management Actions	» Landowners to be advised in accordance with QR Land Access Protocol developed for this project.
Performance Measures	» No significant disturbance to native flora and fauna. » No valid complaints from landowners, nearby residents and third parties that cannot be resolved. » Access has been maintained to designated tracks.
Monitoring / Reporting	None
Corrective Action	» Investigations/Corrective actions undertaken as a result of a complaint will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale.

5.8.2.2 Soil and Ground Stability	
Potential Impacts	» Soil erosion » Sedimentation of watercourses
Responsibility	Operations Manager
Performance Objectives	» Minimise the potential for soil erosion. » Adequately prevent or control sediment release to land and water. » Avoid damage to native vegetation or wildlife habitats. » Prevent damage to agricultural production or other land uses.
Management Actions	» Erosion control structures require regular inspection to ensure they are in good condition and are effective. » If erosion is occurring due to inadequate vegetation along the rail corridor, revegetation of these areas should be undertaken. Revegetation works should be conducted in consultation with the landowner. » If significant erosion is encountered, erosion and sediment structures should be installed as per Section 5.8.1.1 Erosion and Sediment Control (Construction). » Vehicular access should be restricted to stable ground where possible. Additional care should taken near waterways and drainage lines especially after rainfall.
Performance Measures	Absence of soil erosion and/or sedimentation of local watercourses.
Monitoring / Reporting	None
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale.

5.8.2.3 Weed Control	
Potential Impacts	» Introduction and/or spread of weeds » Adverse impact upon agricultural activities
Responsibility	Operations Manager
Performance Objectives	» Minimise the introduction and/or spread of weeds » Promptly identify areas requiring weed control » Eliminate infestation of noxious weed species » Effectively control weed species » Avoid impacts on primary industry
Management Actions	» All work is to be undertaken in accordance with the maintenance Weed Management Plan. » Maintenance contractors to ensure they remain on the designated maintenance track and do not disturb surrounding vegetation, including areas replanted with *Dichanthium queenslandicum*.
Performance Measures	» No weed infestation outbreaks » Reduced area impacts in weed infested areas
Monitoring / Reporting	» Monitoring will be on a regular basis during corridor inspections by Queensland Rail staff. » Presence of noxious weeds shall be reported to the appropriate local authorities.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale.

5.8.2.4 Bushfire Prevention	
Potential Impacts	Damage to property infrastructure
Responsibility	Operations Manager
Performance Objectives	» Minimise the risk of bushfire » Protect the public and personnel » Protect property and minimise damage or loss » Protect flora, fauna and habitats and minimise damage or loss. » Protect the spread of bushfire in the event of ignition. » Provide adequate response in the event of ignition.
Management Actions	» Implement measures to prevent and respond to bushfire incidents that are in accordance with the following: – AS 2885.3 – Construction Fire Management Plan – QR Safety and Emergency Plans – Bushfire management plans, which include prevention, preparedness, emergency contacts, equipment, response and training. » Railway operations shall adhere to regulatory and local fire authorities and comply with fire restrictions, notification requirements and permitting procedures. » All vehicles shall be equipped with appropriate vehicle fire extinguishers. » Regular vehicle checks to ensure there is no build up of debris or vegetation matter in areas of the vehicle, which could cause an ignition. » Where combustible or flammable chemicals are required to be stored on site, appropriate fire fighting equipment shall be available. Incompatible chemicals should not be stored together, and where possible flammable liquids should be stored in a flammable liquids cabinet.
Performance Measures	» No outbreaks of bushfire as a result of operations activities.
Monitoring / Reporting	Any fire outbreaks along the rail corridor are to be reported to the Operations Manager.
Corrective Action	» Investigations/corrective actions undertaken as a result of the complaint will be documented and compiled within the Complaints Register. Corrective actions shall be closed out by senior management according to an agreed responsibility and timescale.

6. Conclusions and Recommendations

6.1 Conclusions

The Northern Missing Link (North Goonyella to Newlands) project has been identified as a critical path to facilitate the export of thermal and coking coal, and to allow the Queensland Government to continue its commitment in developing rail and port capacity ahead of increasing demand for domestic and export coal. A referral has been provided to the Commonwealth Department of Environment and Heritage, which has declared the project Not a Controlled Action under the *Environmental Protection and Biodiversity Conservation* Act 1999.

The Northern Missing Link Project (North Goonyella to Newlands) was declared a significant project by the Queensland CoG pursuant to Section 26 of the Queensland *State Development and Public Works Organisation* Act 1971 and this EIS has been prepared and which addresses all the requirements specified under the final Terms of Reference provided in Appendix A.

The Northern Missing Link rail corridor has been chosen, where possible to avoid areas with high environmental values and cultural significance. The major issues and potential impacts identified in this EIS include the following:

- Disruption to property management, including property access, increased safety risk, restrictions to cattle and vehicle movement and loss of land.
- Introduction and spread of weed species along the alignment.
- Loss of threatened ecological communities and habitat for threatened flora and fauna species;
- Disturbance to areas of cultural significance.
- Benefits to local, regional and state economy.
- Temporary increase in traffic to local road network.

Measures to minimise these impacts are discussed below.

Measures proposed to minimise the impact of the rail corridor on cattle property management include: the provision of dedicated crossings points for cattle and farm vehicles; provision of a phone number to QR train operations to allow landowners to efficiently manage cattle movement across the rail line and financial compensation for the replacement or duplication of infrastructure (fencing, stock yards, water points).

To minimise the spread of weed species along the alignment a project specific Weed Management Plan will be prepared for the construction phase of the project. This plan will include for the provision of weed wash down bays, vehicle signage and training.

To minimise the loss of threatened ecological communities and habitat for threatened species, the alignment will be chosen to avoid large intact ecological communities and habitat areas. Specifically designed culverts will be provided to facilitate fauna passage under the rail corridor in key habitat areas for threatened fauna species and seed collection and re-planting of threatened flora species will be included in rehabilitation activities.

The rail alignment will be located to avoid where possible sites of high cultural significance or sites unable to be salvaged. All remaining cultural heritage sites that may be disturbed will be salvaged and

relocated prior to the construction of the NML. Cultural Heritage Management Plans (CHMP) will be prepared for the project.

During the construction phase, the project may result in minor increases in traffic volumes on the surrounding road network. These increases will be temporary and measures to minimise impacts to other traffic users including the preparation of a Traffic Management Plan will be implemented.

Alleviation of the potential impacts of the project can be achieved by implementing the management commitments outlined in Appendix M and the management actions provided in the Environmental Management Plans (Construction and Operation).

Provided these mitigation measures and management commitments are implemented the project will not adversely affect areas of conservation values, important cultural heritage sites, or have detrimental effects on the management of impacted properties or to local community and public.

The information provided in this report and the consultation undertaken to date as part of this project is sufficient to address the requirement to allow the designation of the NML project as community infrastructure under the Chapter 2, Part 6 of IPA 1997.

6.1.1 Sustainable Development

Sustainable development is defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (Brundtland 1992). At the currrent levels of global energy consumption it is clear that the combustion of coal will remain as a economically and trechnlogically valid means of producing energy and the transport of coal to meet this demand is important in the this process.

Australia's National Strategy for Ecologically Sustainable Development 1992 (NSESD) defines ecologically sustainable development (ESD) as: '*using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased*'. The benefits of this project to the local, regional and state level will allow the contiunal growth of State and National ecomony and the improvement in the quality of life.

Provided the management measures outlined in this report are implemented then this project will conform with the principles of ESD.

6.2 Recommendations

The recommendation of this EIS is that the potential impacts of the NML project have been adequately addressed and that the project should be approved, provided the mitigation measures, commitments and EMP management actions described throughout this document and provided in Appendix M are implemented in full.

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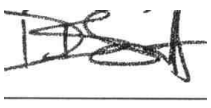
B.	L. Eykamp	L. Gibson		B. Skarratt		10/02/06