

Goonyella to Abbot Point Rail Project

Terms of reference for an environmental impact statement

May 2012

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Introduction

The Goonyella to Abbot Point Rail Project (the project) is proposed by proponents BHP Billiton MetCoal Holdings Pty Ltd. The project involves the development of a dedicated rail line and associated infrastructure to enable export of coal from the Bowen Basin to the Port of Abbot Point, near Bowen.

These terms of reference (TOR) set out the matters to be addressed in an environmental impact statement (EIS) for the project. The TOR has been prepared having regard to comments and submissions received on the draft TOR released for public comment over the period of 4 February 2012 to 5 March 2012.

The document is divided into two parts:

- (a) About the project (page 2)
- (b) Contents of the EIS (page 6).

The TOR must be read in conjunction with *Preparing an environmental impact statement: Guideline for proponents*, which explains the following:

- the target audience for the EIS
- stakeholder consultation requirements
- document format
- copy requirements.

The guideline is available from www.projects.industry.qld.gov.au or from the EIS project manager (refer to page 5 for contact details).

Part A About the project

1. Project summary

The project involves the construction and operation of a dedicated, fenced rail line approximately 260 kilometres in length (and associated infrastructure) from the Goonyella Riverside Mine Complex within the Bowen Basin to the Port of Abbot Point, servicing a number of potential new mines and expansion projects. The project lies across the Isaac and Whitsunday Regional Councils.

The project is expected to ultimately enable the transport of approximately 60 million tonnes per annum (Mtpa) of coal from existing and planned BHP Billiton Mitsubishi Alliance (BMA) and BHP Mitsui Coal (BMC) mines within the Bowen Basin for export. The rail corridor will be approximately 60 metres wide, with an expected train weight of up to 10 000 tonnes.

BHP Billiton Limited has been selected by North Queensland Bulk Ports (NQBPs) as the preferred developer for the T2 coal terminal at Abbot Point and is currently working with NQBPs to enter into a framework agreement to progress the T2 project and finalise preliminary design and environmental studies.

The project will largely service metallurgical coal markets and have a nominal project life of 100 years, inclusive of construction, operation and decommissioning. BHP Billiton assets hold around half of the metallurgical coal resources in the Bowen Basin, providing the basis for the project, which will enable exports from these assets to exceed 100 Mtpa.

Construction of the project is proposed to start no later than 2015. First coal transport is expected in 2016, ramping up to 60 Mtpa between 2020 and 2025.

The project is expected to employ approximately 2000 people during peak construction and up to 500 people during operation. It is projected that a significant number of additional jobs will be created for local and state suppliers and contractors.

The proposed rail alignment is presented in Figure 1. Preliminary investigation corridors for the rail route were presented in the initial advice statement (submitted 25 August 2011). The preferred investigation corridor for the rail route was selected in consideration of social, cultural, environmental, engineering, cost and operational factors.

Further information on the project can be viewed at:
www.projects.industry.qld.gov.au

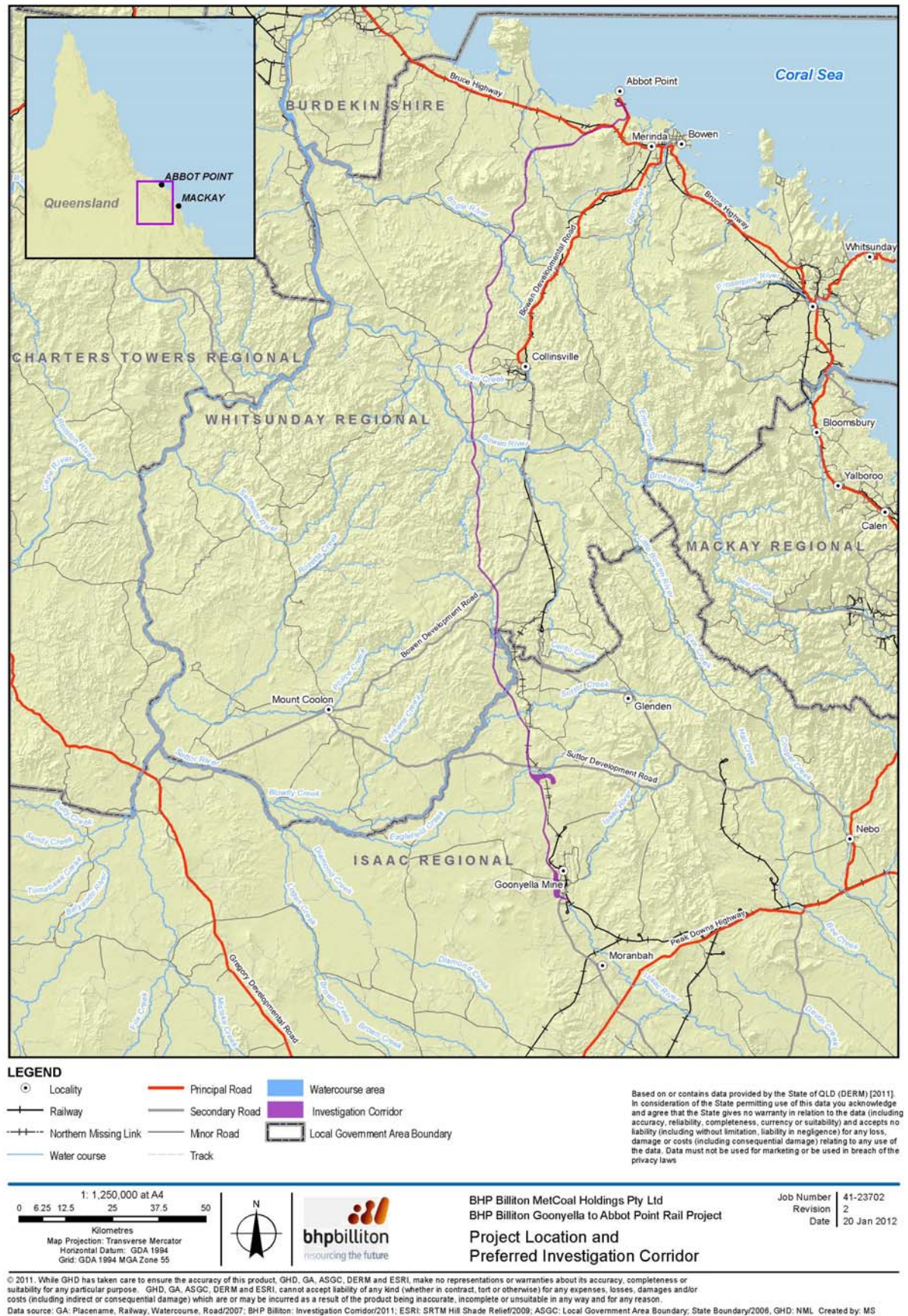


Figure 1 Project location map—preferred rail route investigation corridor

About the project

Goonyella to Abbot Point Rail Project:

Terms of reference for an environmental impact statement

2. Project proponent

The proponent, BHP Billiton MetCoal Holdings Pty Ltd, is a member of the BHP Billiton Group (BHP Billiton), which is headquartered in Melbourne, Australia. BHP Billiton is among the world's top producers of a range of major commodities, including metallurgical coal, energy coal, iron ore, aluminium, copper, manganese, uranium, nickel, silver and titanium minerals, and has substantial interests in oil and gas. BHP Billiton has financial strength through strong cash flow along with access to global capital markets and resource positions, which provide a significant growth platform.

BHP Billiton's metallurgical coal group is the largest global exporter of high quality hard coking coal for the international steel industry. BHP Billiton also supplies a wide range of other coal qualities to satisfy specific customer requirements. BHP Billiton's metallurgical coal operations include the existing and planned BMA and BMC mines in the Bowen Basin.

Contact details for the project proponent appear below:

BHP Billiton MetCoal Holdings Pty Ltd – Goonyella to Abbot Point Rail Project

Phone: 1800 108 807 (freecall)
Email: enquiries2@bhpbilliton.com
Address: GPO Box 971, Brisbane, QLD, 4001

3. Legislative framework

On 17 October 2011, the Coordinator-General declared the project to be a 'significant project' under section 26(1)(a) of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act). This declaration initiated the statutory environmental impact assessment procedure of Part 4 of the SDPWO Act, which requires the proponent to prepare an EIS for the project.

The declaration of the project as a 'significant project' does not indicate support for or approval of the project by the Coordinator-General or the Queensland Government. Rather, it is a requirement for the project to undergo a rigorous EIS process.

On 23 September 2011, the Commonwealth Minister for Sustainability, Environment, Water, Population and Communities determined the project may have a significant impact upon matters of national environmental significance (MNES) (reference number EPBC 2011/5979). The minister is conducting a separate assessment process under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth). This TOR does not cover MNES.

3.1 Coordinator-General's report

At the conclusion of the EIS process, the Coordinator-General will prepare a report evaluating the EIS (Coordinator-General's report). If the report states conditions under the following Queensland Acts, the Coordinator-General is required to provide the responsible minister(s) with a copy of the report:

- *Mineral Resources Act 1989*
- *Environmental Protection Act 1994 (EP Act)*
- *Petroleum and Gas (Production and Safety) Act 2004*
- *Greenhouse Gas Storage Act 2009.*

4. Contact details

For further inquiries about the EIS process for this project, please contact:

EIS Project Manager—Goonyella to Abbot Point Rail Project

Significant Projects Coordination

Coordinator-General

PO Box 15517

City East Qld 4002

tel + 61 7 3404 6999

fax + 61 7 3225 8282

email goonyella_rail@coordinatorgeneral.qld.gov.au

web www.projects.industry.qld.gov.au

Part B Contents of the EIS

The EIS should follow the format and content outlined in this TOR; however, changes to the structure can be discussed with the EIS project manager.

1. Executive summary

The executive summary should convey the most important aspects and options relating to the project to the reader in a concise and readable form. It should use plain English, avoid using jargon, be written as a stand-alone document and be structured to follow the EIS. It should be easy to reproduce and distribute on request to interested parties who may not wish to read or purchase the whole EIS.

The executive summary should include:

- project title
- proponent's name and contact details
- a discussion of previous projects undertaken by the proponent, if applicable, and their commitment to effective environmental management
- a concise statement of the aims and objectives of the project
- the legal framework, decision-making authorities and advisory agencies
- an outline of the background and need for the project, including the consequences of not proceeding with the project
- an outline of the alternative options considered and reasons for selecting the proposed development option
- a brief description of the project (pre-construction, construction, operational activities and decommissioning) and the existing environment, using visual aids where appropriate
- an outline of the principal environmental impacts predicted and the proposed environmental management strategies and commitments to minimise the significance of these impacts
- a discussion of the cumulative impacts in relation to social, economic and environmental factors of associated infrastructure projects proposed within the region
- include detailed maps of the proposed project location and any other critical figures.

2. Glossary of terms

Provide a glossary of technical terms, acronyms, abbreviations and references.

3. Introduction

Clearly explain the function of the EIS, why it has been prepared and what it sets out to achieve. Include an overview of the structure of the document.

3.1 Project proponent

Describe the proponent's experience, including the nature and extent of business activities, experience and qualifications, and environmental record, including the proponent's environmental, health, safety and community policies.

3.2 Project description

Briefly describe the key elements of the project with illustrations or maps. Summarise any major associated infrastructure requirements. Provide detailed descriptions of the project in Part B, Section 4 (refer to page 12).

3.3 Project rationale

Describe the specific objectives and justification for the project, including its strategic, economic, environmental and social implications, technical feasibility and commercial drivers. Discuss the status of the project in a regional, state and national context. Explain the project's compatibility with relevant policy, planning and regulatory frameworks.

Due to this project's proximity to rail lines proposed to link the Galilee Basin to Abbot Point, the project rationale is to describe how the project will accommodate the State government's policy that, for whichever proponent's rail solution is implemented to facilitate development of the Galilee Basin, the best corridor is identified for the proposed rail lines from both the Galilee Basin and the Bowen Basin to Abbot Point, which can accommodate the requirements of those different lines.

Inherent in this policy is that a corridor is developed which, to the greatest extent possible, minimises real and potential impacts, including land acquisition issues, ongoing farm management, severance, floodplain issues and the environment generally.

3.4 Relationship to other projects

Describe how the project relates to other infrastructure projects (of which the proponent should reasonably be aware) that have been, are being taken or that have been approved in the area affected by the project.

As a result of this assessment, there may be opportunities to co-locate existing or proposed infrastructure, enabling efficiency gains and mitigating environmental and property impacts. Where co-location may be likely, outline opportunities to coordinate or enhance impact mitigation strategies. Discuss the opportunities in sufficient detail to enable the reader to understand the reasons for preferring certain options or courses of action and rejecting others.

3.5 Project alternatives

Describe feasible alternatives including conceptual, technological and locality alternatives to the proposed project and the consequences of not proceeding with the project. Include in this description alternative location, design and construction methodology options considered for the balloon loop within the Abbot Point State

Development Area (APSDA). Detail the criteria used to determine the alternatives and provide sufficient detail to enable the reader to understand why certain options or courses of action are preferred and why others are rejected (including the 'no action' option). Discuss the interdependencies of the project components, particularly in regard to how any infrastructure requirements relate to the viability of the project.

This information is required to assess why the scope of the project is as it is and to ensure that environmentally sustainable design principles and sustainable development aspects have been considered and incorporated during the scoping of the project.

3.6 The environmental impact assessment process

3.6.1 Methodology of the EIS

Provide an outline of the environmental impact assessment process, including the role of the EIS in the Coordinator-General's decision-making process. Include information on relevant stages of the EIS development, statutory and public consultation requirements and any interdependencies that exist between approvals sought. The information in this section is required to ensure:

- relevant legislation is addressed
- readers are informed of the process to be followed
- stakeholders are aware of any opportunities for input and participation.

3.6.2 Objectives of the EIS

Provide a statement of the objectives of the environmental impact assessment process. The structure of the EIS can then be outlined and used to explain how the EIS will meet its objectives. The purpose of the EIS is to:

- provide public information on the need for the project, alternatives to it and options for its implementation
- present the likely effects of the project on the natural, social and economic environment
- demonstrate how environmental impacts can be avoided, managed or mitigated and the offsets for any residual impacts
- provide information to formulate the project's EMP.

3.6.3 Submissions

Inform the reader how to properly make submissions and what form the submissions should take. Inform the reader how and when properly made public submissions on the EIS will be addressed and taken into account in the decision-making process. Also indicate any implications for submissions in the event of any appeal processes.

3.7 Public consultation process

3.7.1 Overview

The public consultation process should provide opportunities for community involvement and education. It may include interviews with individuals, public

communication activities, interest group meetings, printed material and other mechanisms to encourage and facilitate active public consultation. The public consultation processes (community engagement) for all parts of the EIS should be integrated.

Consultation with advisory agencies should be the principal forum for identifying legislation, regulations, policies and guidelines relevant to the project and EIS process.

3.7.2 Consultation plan

Develop and implement a comprehensive and inclusive consultation plan with the stakeholder groups identified in section 3.2 of *Preparing an EIS: Guideline for proponents*.

The consultation plan should identify broad issues of concern to local and regional community and interest groups and address issues from project planning through commencement, project operations and decommissioning. The consultation plan should identify:

- the stakeholders to be targeted
- the types of consultation and communication activities to be undertaken
- timing of activities
- how consultation activities will be integrated with other EIS activities and the project development process
- consultation responsibilities
- communication protocols
- reporting and feedback arrangements
- how results of consultation will be considered by the proponent and integrated into the EIS process.

3.7.3 Public consultation report

Include, as an appendix, a public consultation report detailing how the public consultation plan was implemented, and the results. It must include:

- a list of stakeholders identified, including the Australian and Queensland governments, and local government agencies, and/or the affected parties (as defined by the EP Act)
- criteria for identifying stakeholders and methods used to communicate with them
- details of the activities conducted to date and the future consultation strategies and programs, including those during the operational phase of the project (also outlined and included in the EMP).
- a summary of the issues raised by stakeholders and the means by which the issues have been addressed
- details of how consultation involvement and outcomes were integrated into the EIS process

- details of how consultation outcomes will be integrated into future site activities (including opportunities for engagement and provision for feedback and action if necessary).

3.8 Project approvals

3.8.1 Relevant legislation and approvals

List and describe Commonwealth, state and local legislation and policies relevant to the planning, approval, construction and operation of the project. Identify all approvals, permits, licences and authorities that will need to be obtained for the proposed project, in particular those the proponent seeks to be included in the Coordinator-General's evaluation report. Outline the triggers for the application of each of these and identify relevant approval requirements.

Relevant Commonwealth legislation may include, but is not limited to:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1994*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *Native Title Act 1993.*

Identify and outline relevant Commonwealth obligations such as:

- protection of World Heritage values
- migratory animals (China–Australia Migratory Bird Agreement (CAMBA), Japan–Australia Migratory Bird Agreement (JAMBA), Republic of Korea–Australia Migratory Bird Agreement (ROKAMBA) and Bonn Convention)
- biodiversity
- climate
- wetlands of international importance (Ramsar).

Include reference to the fact that a separate assessment is being conducted under the EPBC Act.

Where relevant, refer to applicable Queensland legislation, which may include but is not limited to:

- *Aboriginal Cultural Heritage Act 2003*
- *Coastal Protection and Management Act 1995*
- *Dangerous Goods Safety Management Act 2001*
- *Disaster Management Act 2003*
- *Environmental Protection Act 1994*
- *Fisheries Act 1994*
- *Forestry Act 1959*
- *Land Act 1994*
- *Land Protection (Pest and Stock Route Management) Act 2002*
- *Marine Parks Act 2004*
- *Mineral Resources Act 1989*

- *Native Title (Qld) Act 1993*
- *Nature Conservation Act 1992 (NC Act)*
- *Petroleum and Gas (Production and Safety) Act 2004*
- *Queensland Heritage Act 1992*
- *Rail Safety Act 2010*
- SDPWO Act
- *Strategic Cropping Land Act 2011*
- SPA
- *Transport Infrastructure Act 1994*
- *Transport Operations (Road Use Management) Act 1995*
- *Transport Planning and Coordination Act 1994*
- *Vegetation Management Act 1999 (VM Act)*
- Water Act.

Briefly describe each environmentally relevant activity (ERA) and associated activities that are to be carried out in connection with the project. Present a detailed description of each ERA in Section 5 (

Environmental values and management of impacts

and detail the impact on land, water, air, noise and any other relevant environmental values identified.

The above information will allow for informed decisions to be made on the project, consistent with the provisions of the EP Act.

3.8.2 Relevant plans

Outline the project's consistency with the existing national, state, regional and local planning framework that applies to the project location. Refer to all relevant statutory and non-statutory plans, planning policies, guidelines, strategies and agreements including, but not limited, to:

- Whitsunday Shire Planning Scheme 2009 (adopted by Whitsunday Regional Council)
- Relevant Shire Planning Schemes in force within Isaac Regional Council:
 - Belyando Shire Planning Scheme
 - Nebo Plan
- Mackay, Isaac and Whitsunday Regional Plan
- The Development Scheme for the APSDA
- The Port of Abbot Point Land Use Plan
- Applicable State Planning Policies
- Queensland Biosecurity Strategy 2009–14.

4. Description of the project

Describe the project through its lifetime of pre-construction, construction, operation and decommissioning. The project description also allows further assessment of which approvals may be required and how they may be managed through the life of the project.

4.1 Overview of the project

Provide an overview of the project to put it into context. Include:

- a rationale explaining the selection of the preferred operating scenario, including details such as cost, environmental impacts, and the operational efficiencies of each option
- a description of the key components of the project including the use of text and design plans where applicable
- a summary of any environmental design features of the project
- the expected cost, timing, and overall duration of the project, including details of and justification for, any staging of the development.

4.2 Location

Describe, using maps at suitable scales, the regional and local context of the project and all associated infrastructure. Provide real property descriptions of the project. Maps should show the precise location of the project area, in particular the:

- location and boundaries of current or proposed land tenures that the project area is or will be subject to, and details of the ownership of that land
- location and boundaries of the project footprint, including easement widths and access requirements
- location of any proposed buffers surrounding the working areas (for construction and operation)
- location of existing infrastructure relevant to the project including rail lines, state-controlled roads and local roads as relevant to the project site
- location of project components and details of infrastructure proposed within and near the boundary of the APSDA
- location of natural features such as waterways (e.g. rivers, streams, creeks, other water bodies and wetlands) and shorelines including features such as Highest Astronomical Tide and location of marine plants (if relevant)
- location of any proposed site offices and worker accommodation sites
- views to and from the site.

4.2.1 Tenements and tenures

Describe and illustrate any existing mining tenements, petroleum (including coal seam gas), geothermal and greenhouse gas tenures and licences overlying and adjacent to the project site, and any proposed applications required for this project.

Describe in detail any issues related to the overlap of tenements and tenures for different resources or purposes, including the sequential exploitation of the resources or uses to which the tenements and tenures may be put.

4.3 Construction

Provide the following information on the pre-construction, construction and commissioning of the project including detailed plans where appropriate. Potential impacts of all construction activities are to be described in accordance with subsections of Section 5 of this TOR (Environmental values and management of impacts).

Make specific reference to the balloon loop within the APSDA in the description of all construction activities.

4.3.1 Pre-construction activities

Describe all pre-construction activities, including:

- approvals required for this stage
- land acquisitions required, be it in full or as easements, leases etc.
- nature, scale and timing for vegetation clearing
- site access
- earthworks
- interference with watercourses and floodplain areas, including wetlands
- site establishment requirements for construction facilities, including access restriction measures and expected size, source and control of the construction workforce accommodation, services (water, sewage, communication, power, recreation) and safety requirements
- temporary works
- upgrade, relocation, realignment, deviation of or restricted access to roads and other infrastructure.

4.3.2 Construction

Describe all the construction elements of the project, including:

- an indicative construction timetable, including expected commissioning and start-up dates and hours of operation
- estimated numbers and roles of persons to be employed during the construction phase of the project
- major work programs for the construction phase, including an outline of construction methodologies
- construction inputs, handling and storage including an outline of potential locations for source of construction materials. Include proposed sources for extractive materials required for construction of the project, particularly State-owned quarry materials on State and freehold land
- major hazardous materials to be transported, stored and/or used on site, including environmental toxicity data and biodegradability

- clean-up and restoration of areas used during construction, including camp site(s) and storage areas
- sources of water to be used for construction including camp site(s) and authorisations required under the Water Act.

4.3.3 Commissioning

Describe the commissioning process including the associated environmental impacts.

4.3.4 Other infrastructure

Describe:

- all other infrastructure required to be constructed, upgraded, relocated or decommissioned for the construction and/or operation of the project, such as resource extraction areas, access roads and other transportation, power supply, telecommunications, connection to sewerage or water supply, and waste disposal
- the design and construction standards to be met (e.g. waterway crossings should be designed to meet the requirements of the *Fisheries Act 1994* (Qld) and in consultation with the government agency responsible for administering this Act)
- alternative approaches or the opportunity to obtain materials from alternative sources.

4.4 Operation

Provide full details of the operation for all elements of the project, including:

- a description of the project site, including concept and layout plans of buildings, structures, plant and equipment to be employed
- nature and description of all key operational activities, with particular attention to:
 - train lengths and frequency of train movements
 - potential impacts on North Coast Line rail services
- the capacity of the project equipment and operations
- estimated numbers and roles of persons to be employed during the operational phase of the project including estimates of contractors and subcontractors (full details to be provided in response to Part B, Section 6.1.4 of this TOR)
- summary of traffic generated and transport requirements for the operations of the project and facilities associated with the project, including movement of workers (full details to be provided in response to Part B, Section 5.10 of this TOR).

The potential impacts of operation of this project are to be described in accordance with Section 5, of this TOR (Environmental values and management of impacts).

4.5 Decommissioning and rehabilitation

Describe the options, strategies and methods for progressive and final rehabilitation of the environment disturbed by the project, including:

- developing a preferred rehabilitation strategy with a view to minimising the amount of land disturbed at any one time

- illustrating the final topography of any excavations, waste areas and dam sites on maps at a suitable scale
- describing the means of decommissioning the project—in terms of removing equipment, structures and buildings—and the methods proposed for stabilising the affected areas
- discussing options and methods for disposing of wastes generated by demolishing project infrastructure, including sufficient detail for their feasibility and suitability to be established
- discussing future land tenure arrangements post-decommissioning of the project.

Include the impacts of the preferred rehabilitation strategy in the appropriate subsections of Part B, Section 5 (refer to page 15).

Refer to infrastructure that is not intended to be decommissioned. In this situation, describe the entity to which the infrastructure is intended to be transferred, and the proposed environmental management regimes.

5. Environmental values and management of impacts

Detail the environmental protection and mitigation measures incorporated in the planning, construction, rehabilitation, commissioning, operation and decommissioning of all facets of the project. Measures should prevent, or where prevention is not possible, minimise environmental harm and maximise environmental benefits of the project. Identify and describe preferred measures in more detail than other alternatives.

The objectives of the following subsections are to:

- describe the existing environmental values of the area that may be affected by the project, using background information and/or new studies to support statements (include reference to all definitions of environmental values set out in relevant legislation, policies and plans)
- describe the potential adverse and beneficial impacts of the project on the identified environmental values and the measures taken to avoid, minimise and/or mitigate those impacts
- describe any cumulative impacts on environmental values caused by the project, either in isolation or in combination with other known existing or planned projects
- present objectives, standards and measurable indicators that protect the identified environmental values
- examine viable alternative strategies for managing impacts (present and compare these alternatives in view of the stated objectives and standards to be achieved)
- discuss the available techniques to control and manage impacts in relation to the nominated objectives.

Where negative impacts of the project cannot be avoided or adequately minimised or mitigated, provide proposals to offset impacts in accordance with the Queensland Government Environmental Offsets Policy (Environmental Protection Agency 2008b).

The EIS should follow the format and content outlined in this TOR; however, changes to the structure can be discussed with the EIS project manager. The mitigation measures, monitoring programs etc., identified in this section of the EIS should be used to develop the EMP for the project. Refer to Part B, Section 10 (page 53).

5.1 Climate, natural hazards and climate change

Describe the climatic conditions that may affect management of the project. This includes a description of the vulnerability of the project area to seasonal conditions, extremes of climate and natural or induced hazards. Provide a risk assessment and management plan detailing these potential threats to the construction, and operation of the project.

Address the most recent information on potential impacts of climatic factors in the appropriate sections of the EIS.

Include an assessment of climate change risks and possible adaptation strategies, as well as the following:

- a risk assessment of changing climate patterns that may affect the viability and environmental management of the project
- the preferred and alternative adaptation strategies to be implemented
- commitments to working cooperatively, where practicable, with government, other industry and other sectors to address adaptation to climate change.

5.1.1 Flood plain management

A comprehensive flood study should be included in the EIS, with particular regard to natural waterways and adjacent floodplain areas determined to have a high flood risk, which includes:

- quantification of flood impacts on properties surrounding and external to the project site from redirection or concentration of flows
- identification of likely increased flood levels, increased flow velocities or increased time of flood inundation as a result of the development.

The flood study should address any requirements of local or regional planning schemes for flood affected areas. Flood studies should include a range of annual exceedence probabilities for affected waterways, where data permits. The study report should include details of all calculations along with descriptions of base data, any potential for loss of flood plain storage, and triangulated surface meshes produced in terrain modelling software. Reference must be made to any studies undertaken by the local council in relation to flooding.

5.2 Land

Detail the existing land environment values for all areas associated with the project. Describe the potential for the construction and operation of the project to change existing and potential land uses of the project sites and adjacent areas.

5.2.1 Scenic amenity and lighting

Description of environmental values

Describe, in general terms, the existing character of the landscape and the general impression that would be obtained while travelling through and around it. Outline existing landscape features, panoramas and views that have, or could be expected to have, value to the community. Include information such as maps and photographs, particularly where addressing the following issues:

- major views, view sheds, outlooks, and features contributing to the amenity of the area, including assessment from private residences
- focal points, landmarks, waterways and other features contributing to the visual quality of the area and the project site(s)
- character of the local and surrounding areas including vegetation and land use.

Potential impacts and mitigation measures

Describe the potential beneficial and adverse impacts of the project on landscape character and visual qualities of the site and the surrounding area. Explain what measures will be undertaken to mitigate or avoid the identified impacts.

Lighting

Provide an assessment of all potential impacts of the project's lighting, during all stages, with particular reference to objectives to be achieved and management methods to be implemented to mitigate or avoid, such as:

- the visual impact at night
- night operations/maintenance and effects of lighting on fauna and residents
- the potential impact of increased vehicular traffic
- changed habitat conditions for nocturnal fauna and associated impacts.

5.2.2 Topography, geology and soils

Description of environmental values

Provide maps locating the project in state, regional and local contexts. The topography should be detailed with contours at suitable increments, shown with respect to Australian height datum. Include significant features of the landscape and topography, and accompanying comments on the maps.

Provide a description, map and a series of cross-sections of the geology of the project area relevant to the project components. Describe the geological properties that may influence ground stability, occupational health and safety, or the quality of stormwater leaving any area disturbed by the project. In locations where the age and type of geology is such that significant fossil specimens may be uncovered during construction/operations, address the potential for significant finds.

Conduct a soil survey of the sites affected by the project, in line with the 'Soils and Geology Scope Methodology and Structure' document developed in consultation with the Department of Environment and Resource Management in December 2011 (BHP

Billiton, Document #23702-D-RP-0008, Rev 0, 12 December 2011) (Appendix 1). A soil survey of the sites affected by the project must be conducted at the scale presented in the above 'Methodology and Scope' document, with particular reference to the identification of strategic cropping land (SCL); good quality agricultural land; and the physical and chemical properties of the materials that can influence erosion potential, stormwater run-off quality, rehabilitation and agricultural productivity of the land. Provide information on soil stability and suitability for construction of project facilities.

Assess the potential for acid sulfate soils in accordance with:

- Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines (Dear et al. 2002)
- Acid Sulfate Soil Management Plans for Queensland. *Acid Sulfate Soils: Environmental Issues, Assessment and Management* (Ahern et al. (eds) 2000)
- Queensland Acid Sulfate Soils Investigation Team (QASSIT) guidelines (refer to: www.derm.qld.gov.au/land/ass/products.html)
- State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils (Department of Natural Resources and Mines & Department of Local Government and Planning 2002a)
- *State Planning Policy 2/02 Guideline: Acid Sulfate Soils* (Department of Natural Resources and Mines & Department of Local Government and Planning 2002b).

The assessment should be conducted with reference to the *Guidelines for Surveying Soil and Land Resources* (McKenzie et al. 2008) and *Australian soil classification* (Isbell & CSIRO 2002). The assessment should include an appraisal of the depth and quality of usable soil and include an evaluation of each soil's agricultural land suitability in accordance with:

- *Guidelines for agricultural land evaluation in Queensland* (Department of Primary Industries 1990)
- *Planning guidelines: the identification of Good Quality Agricultural Land* (Department of Primary Industries & Department of Housing, Local Government and Planning 1993)
- State Planning Policy 1/92: Development and the Conservation of Agricultural Land (Department of Primary Industries & Department of Housing, Local Government and Planning 1992).

Identify any areas of land within the project study area identified as 'strategic cropping land or potential strategic cropping land' (SCL) as identified by the *Strategic Cropping Land Act 2011* (Qld) (SCL Act) trigger maps (available from www.derm.qld.gov.au/land/planning/strategic-cropping/mapping.html).

Potential impacts and mitigation measures

Provide details of any potential impacts to the topography or geomorphology associated with the project and proposed mitigation measures, including:

- a discussion of the project in the context of major topographic features and any measures taken to avoid or minimise impact to such, if required

- the objectives to be used for the project in any re-contouring or consolidation, rehabilitation, landscaping, and fencing.

Identify the possible soil erosion rate for all permanent and temporary landforms and describe the techniques used to manage the impact. Include an assessment of likely erosion effects, especially those resulting from removing vegetation, and constructing retaining walls both on-site and off-site for all disturbed areas.

Identify all soil types and outline the erosion potential (both wind and water) and erosion management techniques to be used. Provide details of an erosion monitoring program (including rehabilitation measures for erosion problems identified during construction), and detail acceptable mitigation strategies for the different stages of the project.

Summarise methods proposed to prevent or control erosion with regard to:

- the *Soil Erosion and Sediment Control—Engineering Guidelines for Queensland Construction Sites* (Institution of Engineers Australia 1996)
- the *Guideline Urban Stormwater Quality Planning Guidelines* (Department of Environment and Resource Management 2010)
- preventing soil loss in order to maintain land capability/suitability
- preventing degradation of local waterways.

Discuss the potential for acid generation through disturbance of acid sulfate soils during earthworks and construction, and propose measures to manage soils and mitigate impacts for all site earthworks and construction activities. Should action criteria be triggered by acid-generating potential as a result of testing, outline management measures in an acid sulfate soils management plan prepared in accordance with:

- Queensland Acid Sulfate Soils Investigation Team (QASSIT) guidelines (refer to: www.derm.qld.gov.au/land/ass/products.html#guidelines)
- the requirements of State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils (Department of Natural Resources and Mines & Department of Local Government and Planning 2002)
- *State Planning Policy 2/02 Guideline: Acid Sulfate Soils* (Department of Natural Resources and Mines and Department of Local Government and Planning 2002).

Identify any areas within the project footprint likely to temporarily or permanently impact SCL. Where areas of identified SCL are likely to be permanently alienated by the project, the proponent should discuss undertaking of the SCL assessment process as defined by the SCL Act with the government agency responsible for administering that Act.

Resource utilisation

Consider the impacts of the project on current and proposed resource mining operations. Analyse the effectiveness of the proposal in minimising effects on the optimum utilisation of the coal/mineral resources within the project area, and consider its impacts on other resources.

Describe how the proposal will avoid any unnecessary sterilisation of the state's coal, mineral and petroleum (including gas and coal seam methane) resources that may be impacted upon or sterilised by the project infrastructure and activities.

5.2.3 Land contamination

Description of environmental values

Include:

- mapping of any areas listed on the Environmental Management Register or Contaminated Land Register under the EP Act
- identification of any potentially contaminated sites not on the registers whether or not remediation is required
- a description of the nature and extent of contamination at each site.

Potential impacts and mitigation measures

Discuss the management of any contaminated land and potential for contamination from construction, commissioning and operation, in accordance with *Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland* (Department of Environment 1998) and the National Environment Protection (Assessment of Site Contamination) Measure 1999 (Cwlth).

Describe strategies and methods to be used to prevent and manage any land contamination resulting from the project, including the management of any acid generation or management of chemicals and fuels to prevent spills or leaks.

State any intentions concerning the classification of land contamination after project completion.

5.2.4 Land use and tenure

Description of environmental situation

Identify, with the aid of maps:

- land tenure, including reserves, tenure of special interest such as protected areas and forest reserves, existing and proposed gas infrastructure, water pipelines, powerlines and transport corridors, including local and state-controlled roads (and crossings of these), stock routes, rail corridors and other infrastructure
- existing land uses and facilities surrounding the project
- land suitability for the project
- distance of the project from residential and recreational areas
- declared water storage catchments
- location of the project in relation to environmentally sensitive areas and areas of conservation value.

Potential impacts and mitigation measures

Describe the potential changes to existing and potential land uses due to the construction and operation of the project. In particular, describe the following:

- impacts on project site and adjacent land uses and human activities and strategies for mitigation, such as those required by:
 - State Planning Policy 1/92: Development and the Conservation of Agricultural land (Department of Housing, Local Government and Planning & Department of Primary Industries 1992) and *Planning guidelines: The identification of good quality agricultural land* (Department of Primary Industries & Department of Housing, Local Government and Planning 1993)
 - State Planning Policy 1/12: Protection of Queensland's Strategic Cropping Land (Department of Environment and Resource Management 2012)
 - State Planning Policy 2/07: Protection of Extractive Resources (Department of Mines and Energy 2007a) and *State Planning Policy 2/07 Guideline: Protection of Extractive Resources* (Department of Mines and Energy 2007b), especially with respect to 'key resource areas' defined by that guideline
 - local government planning schemes
 - SDA development schemes, including a description of how the project will comply with relevant provisions of the Development Scheme for the APSDA and the Port of Abbot Point Land Use Plan.
- possible effect on town planning objectives and controls, including local government zoning and strategic plans
- impacts of grade separated road crossings on land tenure, and the approvals process for any changes to tenure
- constraints to potential developments and possibilities of rezoning adjacent to the development area
- management of the immediate environs of the project including construction buffer zones
- the potential native title rights and interests likely to be impacted upon by the project and the potential for managing those impacts by an Indigenous land use agreement or other native title compliance outcomes
- impacts on the use and management of the stock route network due to the construction and operation of the project. Outline measures to maintain the extent and functioning of the stock route network and associated infrastructure including fences, watering facilities, and access
- proposed land use changes in any areas of high conservation value and information on how easement widths and vegetation clearance in sensitive environmental areas will be minimised
- potential issues involved in proximity and/or co-location of other current or proposed infrastructure services
- any land uses requiring specific management measures.

5.3 Nature conservation

Detail the existing nature conservation values that may be affected by the proposal. Describe the environmental values in terms of:

- integrity of ecological processes, including habitats of rare and threatened species
- conservation of resources
- biological diversity, including habitats of rare and threatened species
- integrity of landscapes and places including wilderness and similar natural places
- aquatic and terrestrial ecosystems.

Survey effort should be developed in consultation with relevant state government agencies and should be sufficient to identify, or adequately extrapolate, the floral and faunal values over the range of seasons, particularly during and following a wet season. The survey should account for the ephemeral nature of watercourses traversing the proposal area, and seasonal variation in fauna populations.

Make specific reference to the impacts of the balloon loop proposed within the APSDA in the assessment of impacts required by matter addressed under Section 5.3 of this TOR.

Provide a list of EPBC Act listed threatened species and communities and listed migratory species identified as likely to be effected by the project. This is required to allow comparison with species and ecosystems listed as 'endangered' or 'of concern' under state legislation.

Wherever possible, seek the involvement of the local Indigenous community in conducting field observations and survey activities to identify the traditional and contemporary Indigenous uses of species.

Also outline the proposed strategies to avoid, or minimise and mitigate, impacts on the identified values within the project's footprint.

Identify key flora and fauna indicators for ongoing monitoring.

5.3.1 Sensitive environmental areas

Description of environmental values

Identify areas that are environmentally sensitive in proximity to the project on a map of suitable scale. This should include areas classified as having national, state, regional or local biodiversity significance, or flagged as important for their integrated biodiversity values. Refer to Queensland legislation and policies on threatened species and ecological communities.

Areas regarded as sensitive with respect to flora and fauna have one or more of the following features and should be identified and mapped:

- important habitats of species listed under the NC Act as presumed extinct in the wild, endangered, vulnerable or near-threatened
- regional ecosystems listed as 'endangered' or 'of concern' under state legislation
- good representative examples of remnant regional ecosystems or regional ecosystems that are described as having 'medium' or 'low' representation in the protected area estate as defined in the Regional Ecosystem Description Database (REDD) available at www.derm.qld.gov.au/wildlife-ecosystems/biodiversity/regional_ecosystems/index.php

- sites listed under international treaties such as Ramsar wetlands and World Heritage areas
- sites containing near-threatened or bio-regionally significant species or essential, viable habitat for near-threatened or bio-regionally significant species
- sites in, or adjacent to, areas containing important resting, feeding or breeding sites for migratory species of conservation concern listed under the Convention of Migratory Species of Wild Animals, and/or bilateral agreements between Australia and other countries
- sites adjacent to nesting beaches, feeding, resting or calving areas of marine species of special interest (e.g. marine turtles, dugong and cetaceans)
- sites containing common species that represent a distributional limit and are of scientific value or that contain feeding, breeding, resting areas for populations of echidna, koala, platypus and other species of special cultural significance
- sites of high biodiversity that are of a suitable size or with connectivity to corridors/protected areas to ensure survival in the longer term; such land may contain:
 - natural vegetation in good condition or other habitat in good condition (e.g. wetlands)
 - degraded vegetation or other habitats that still support high levels of biodiversity or act as an important corridor for maintaining high levels of biodiversity in the area
- a site containing other special ecological values (e.g. high habitat diversity and areas of high endemism)
- ecosystems that provide important ecological functions such as:
 - wetlands of national, state and regional significance including those subject to the State Planning Policy 4/11: Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments (Department of Environment and Resource Management 2011c)
 - riparian vegetation
 - important buffer to a protected area or important habitat corridor between areas as mapped by the Northern Brigalow Belt Biodiversity Planning Assessment
- declared fish habitat areas and sites containing protected marine plants under the *Fisheries Act 1994* (Qld)
- sites of palaeontologic significance such as fossil sites
- sites of geomorphological significance, such as lava tubes or karst
- protected areas that have been proclaimed under the NC Act and *Marine Parks Act 2004* (Qld) or are under consideration for proclamation
- areas of major interest, or critical habitat declared under the NC Act or high nature conservation value areas or areas vulnerable to land degradation under the VM Act.

Areas of special sensitivity include the marine environment and wetlands, wildlife breeding or roosting areas, any significant habitat or relevant bird flight paths for migratory species, bat roosting and breeding caves including existing structures such as adits and shafts, and habitat of threatened plants, animals and communities.

Potential impacts and mitigation measures

Discuss the impact of the project on species, communities and habitats of local, regional or national significance in sensitive environmental areas as identified above. Include human impacts and the control of any domestic animals introduced to the area.

Demonstrate how the project would comply with the following hierarchy:

- avoiding impact on areas of remnant vegetation and other areas of conservation value including listed species and their habitat
- mitigating impacts through rehabilitation and restoration including, where relevant, a discussion of any relevant previous experience or trials of the proposed rehabilitation
- measures to be taken to replace or offset the loss of conservation values where avoiding and mitigating impacts cannot be achieved.

Explain why the measures above would not apply in areas where loss would occur.

Discuss the boundaries of the areas impacted by the project within or adjacent to an endangered ecological community, including details of footprint width. If the project area will impact upon a threatened community, include reasons for the preferred alignment and the viability of alternatives.

Address any actions of the project or likely impacts that require an authority under the NC Act, and/or would be assessable development for the purposes of the VM Act.

Outline how these measures will be implemented in the overall EMP for the project.

Where relevant, this section should discuss environmental offset requirements in accordance with the Queensland Government Environmental Offsets Policy (Environmental Protection Agency 2008b) and take into account the applicable specific-issue offset policies, as follows:

- Policy for Vegetation Management Offsets (Department of Environment and Resource Management 2009a)
- Queensland Biodiversity Offset Policy (Department of Environment and Resource Management 2011b)
- Fish Habitat Management Operational Policy FHMOP 005: Mitigation and Compensation for Works or Activities Causing Marine Fish Habitat Loss (Department of Primary Industries 2002).

Provide sufficient information to demonstrate that offset requirements of relevant policies can be complied with. Consultation with advisory agencies responsible for administering offsets under the above policies is recommended to clarify offset requirements.

Describe any departure from 'no net loss' of ecological values.

5.3.2 Terrestrial flora

Description of environmental values

Provide vegetation mapping for all relevant project sites. Adjacent areas should be mapped to illustrate interconnectivity. Mapping should also illustrate any larger scale

interconnections between areas of remnant or regrowth vegetation where the project site includes a corridor connecting those other areas, with reference to *Method for the Establishment and Survey of Reference Sites for BioCondition, Version 2.0* (Eyre, Kelly & Neldner 2011).

Describe the terrestrial vegetation communities within the affected areas at an appropriate scale (maximum 1:50 000), with mapping produced from aerial photographs and ground-truthing, showing the following:

- location and extent of vegetation types using the regional ecosystem type descriptions in accordance with the REDD
- location of vegetation types of conservation significance based on regional ecosystem types and occurrence of species listed as protected plants under the Nature Conservation (Wildlife) Regulation 1994 (Qld) and subsequent amendments, as well as areas subject to the VM Act
- the current extent (bioregional and catchment) of protected vegetation types of conservation significance within the protected area estate (national parks, conservation parks, resource reserves, nature refuges and conservation reserves under the *Land Act 1994* (Qld))
- any plant communities of cultural, commercial or recreational significance
- the location of any horticultural crops in the vicinity of the project area
- location and abundance of any exotic or weed species.

Note: It is recommended that the proponent carry out a bio-condition assessment of each regional ecosystem to be impacted at the same time as the flora survey as this may be more cost-effective and better inform the proponent of their offset requirements.

Where there is potential to find threatened species within the project area (e.g. special localised habitat) the scale of survey and mapping should be relevant to the particular species.

Highlight sensitive or important vegetation types, including any marine littoral and subtidal zone and riparian vegetation, and their value as habitat for fauna and conservation of specific rare floral and faunal assemblages or community types. The description should contain a review of published information regarding the assessment of the significance of the vegetation to conservation, recreation, scientific, educational and historical interests.

For each significant natural vegetation community likely to be impacted by the project, vegetation surveys should be undertaken at an appropriate number of sites, allowing for seasonal factors, and satisfying the following:

- the relevant regional vegetation management codes
- site data should be recorded in a form compatible with the Queensland Herbarium CORVEG database
- the minimum site size should be 10 × 50 metres
- a complete list of species present at each site should be recorded
- the surveys to include species structure, assemblage, diversity and abundance

- the relative abundance of plant species present to be recorded
- any plant species of conservation, cultural, commercial or recreational significance to be identified
- specimens of species listed as protected plants under the Nature Conservation (Wildlife) Regulation, other than common species, are to be submitted to the Queensland Herbarium for identification.

Existing information on plant species may be used instead of new survey work, provided that the data is derived from previous surveys at the site consistent with the above methodology. The methodology used for flora surveys should be specified in the appendices to the report.

Discuss any variances between site mapping and mapping produced by the Queensland Herbarium, including sufficient details of survey timing, location and methodology to allow assessment of the accuracy of the revised mapping.

Note: Changes to regional ecosystem mapping can be confirmed by application for a Property Map of Assessable Vegetation (PMAV).

Potential impacts and mitigation measures

Describe the potential environmental harm to the ecological values of the area arising from the construction, operation and decommissioning of the project including clearing, salvaging or removing vegetation. Discuss the indirect effects on remaining vegetation. Consider short- and long-term effects and comment on whether the impacts are reversible or irreversible.

With regard to all components of the project, include:

- any management actions to minimise vegetation disturbance and clearance
- a discussion of the ability of identified vegetation to withstand any increased pressure resulting from the project and any measures proposed to mitigate potential impacts
- a description of the methods to ensure rapid rehabilitation of disturbed areas following construction, including the species chosen for revegetation, which should be consistent with the surrounding associations
- details of any post-construction monitoring programs
- a discussion of the potential environmental harm on flora due to any alterations to the local surface and groundwater environment with specific reference to impacts on riparian vegetation or other sensitive vegetation communities.

Outline how these measures will be implemented in the overall EMP for the project. Weed management strategies are required for containing existing weed species (e.g. parthenium and other declared plants) and ensuring no new declared plants are introduced to the area. Refer to the local government authority's pest management plan and any strategies and plans recommended for the project area by Biosecurity Queensland. Discuss how the proponent intends to contribute to the delivery of relevant local area pest/biosecurity management plans. Discuss the strategies in accordance with provisions of the *Land Protection (Pest and Stock Route*

Management) Act 2002 (Qld) in the main body of the EIS and in the pest management plan within the EMP for the project.

5.3.3 Terrestrial fauna

Description of environmental values

Describe the terrestrial and riparian fauna occurring in the areas affected by the proposal, noting the broad distribution patterns in relation to vegetation, topography and substrate. The description of the fauna present or likely to be present in the area should include:

- species diversity (i.e. a species list) and abundance of animals of recognised significance
- any species that are poorly known but suspected of being endangered, vulnerable or near-threatened
- habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
- the existence of feral or introduced animals including those of economic or conservation significance
- existence (actual or likely) of any species/communities of conservation significance in the study area, including discussion of range, habitat, breeding, recruitment feeding and movement requirements, and current level of protection (e.g. any requirements of protected area management plans or threatened species recovery plans)
- habitat requirements and sensitivity to changes, including movement corridors and barriers to movement
- an estimate of commonness or rarity for the listed or otherwise significant species
- use of the area by migratory fauna
- how well any affected communities are represented and protected elsewhere in the bio-region where the project occurs.

Identify any species listed by the NC Act occurring in the project area. Identify any species listed by the 'Back on Track' species prioritisation methodology (refer to www.derm.qld.gov.au/wildlife-ecosystems/wildlife/back_on_track_species_prioritisation_framework/index.html).

Specify the methodology used for fauna surveys. Provide relevant site data to the government agency responsible for maintaining the Wildlife Online database in a format compatible with the database (refer to www.derm.qld.gov.au/wildlife-ecosystems/wildlife/wildlife_online/index.html).

Potential impacts and mitigation measures

The assessment of potential impact should consider impacts the project may have on terrestrial fauna, relevant wildlife habitat and other fauna conservation values, including:

- impacts due to loss of range/habitat, food supply, nest sites, breeding/recruiting potential or movement corridors or as a result of hydrological change

- impacts on native species, particularly species of conservation significance
- cumulative effects of direct and indirect impacts
- threatening processes leading to progressive loss.

Address any actions of the project or likely impacts that require an authority under the NC Act. Provide the following information on mitigation strategies:

- measures to avoid and mitigate the identified impacts. Any provision for buffer zones and movement corridors, nature reserves or special provisions for migratory animals should be discussed and coordinated with the outputs of the flora assessment
 - provide commitments to the provision of fauna passage between habitat fragmented by the rail corridor, of suitable design and location for affected species and their habitat
- details of the methodologies that would be used to avoid injuries to livestock and native fauna as a result of the project's construction and operational works, and if accidental injuries should occur, the methodologies to assess and handle injuries
- strategies for complying with the objectives and management practices of relevant recovery plans.

Outline how these measures will be implemented in the overall EMP for the project. Rehabilitation of disturbed areas should incorporate, where appropriate, provision of nest hollows and ground litter.

Address feral animal management strategies and practices. The study should develop strategies to ensure that the project does not contribute to increased encroachment of a feral animal species. Refer to the local government authority's pest management plan and any strategies and plans recommended for the project area by Biosecurity Queensland. Discuss how the proponent intends to contribute to the delivery of relevant local area pest/biosecurity management plans. Discuss the strategies in accordance with the provisions of the *Land Protection (Pest and Stock Route Management) Act 2002* (Qld) in the main body of the EIS and in the pest management plan within the EMP for the project.

5.3.4 Aquatic biology and ecology

Description of environmental values

Describe the aquatic flora and fauna present, or likely to be present, in the areas affected by the proposal. Include:

- fish species, mammals, reptiles, amphibians, crustaceans and aquatic invertebrates occurring in the waterways within the affected area and any associated wetlands (as defined under section 5 of the Fisheries Act)
- any rare or threatened marine species
- a description of the habitat requirements and the sensitivity of aquatic species to changes in flow regime, water levels and water quality in the project areas
- aquatic plants including native and exotic/weed species
- aquatic and benthic substrate

- habitat downstream of the project or potentially impacted due to currents in associated lacustrine and marine environments
- aquatic substrate and stream type, including extent of tidal influence and common levels such as highest astronomical tide and mean high water springs
- any other state significant biodiversity values identified in the Queensland Biodiversity Offset Policy (version 1) (Department of Environment and Resource Management 2011b) that are not described elsewhere.

Describe any wetlands listed as areas of national, state or regional significance (as previously defined and administered by the Department of Environment and Resource Management—DERM) and detail their values and importance for aquatic flora and fauna species.

Potential impacts and mitigation measures

Discuss the potential impacts of the project on the aquatic ecosystems and describe proposed mitigation actions, including:

- potential impacts due to alterations to the long-term hydrodynamic processes of the coastal environments should be discussed, with specific reference to impacts on riparian vegetation and other sensitive vegetation communities, including mangrove stands and seagrass meadows
- proposed location, type and design of waterway barrier works (temporary and permanent structures in both permanent and ephemeral waterways) that would impact on aquatic resources, particularly fish movement, with an appropriately scaled map
- potential mechanism to ensure adequate fish passage is provided at proposed marine infrastructure
- alternatives to waterway crossings where possible
- measures to avoid fish spawning periods, such as seasonal construction of waterway crossings and measures to facilitate fish movements through water crossings
- offsets proposed for unavoidable, permanent loss of fisheries habitat
- methods to minimise the potential for introducing or spreading weed species or plant disease
- monitoring aquatic biology health, productivity and biodiversity in areas subject to direct discharge
- potential impacts from climate change and the project's potential to increase the susceptibility of aquatic ecological communities and species, e.g. coral bleaching.

Address any actions of the project or likely impacts that require an authority under the relevant legislation, including the NC Act and/or the Fisheries Act. Outline how these measures will be implemented in the overall EMP for the project.

5.4 Water resources

5.4.1 Description of environmental values

Describe and illustrate the surface watercourses, overland flow, palustrine and lacustrine wetlands, estuaries and marine waters that may be affected by the project. The description will include suitably scaled maps of catchments, watercourses, drainage pathways, wetlands, or sources of water supply (such as farm dams) potentially affected by the project, whether on or off the project site.

Describe, with supporting photographs, the geomorphic condition of any watercourses likely to be affected by disturbance or any stream diversions. The results of this description will form the basis for the planning and subsequent monitoring of rehabilitation of the watercourses. The description will be given in the context of environmental values, as defined in such documents as:

- the EP Act
- Environmental Protection (Water) Policy 2009 (EPP (Water)), including:
 - Isaac River Sub-basin Environmental Values and Water Quality Objectives (Department of Environment and Resource Management 2011a)
- *Australia and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000)
- *Queensland Water Quality Guidelines 2009* (Department of Environment and Resource Management 2009b).

Provide an indication of the quality and quantity of water resources in the vicinity of the project area, describing:

- existing surface water in terms of physical, chemical and biological characteristics
- existing surface drainage patterns, flows, history of flooding including extent, levels and frequency and present water uses.

Describe the environmental values of surface waterways of the affected area in terms of:

- values identified in the EPP (Water)
- physical integrity, fluvial processes and morphology, including riparian zone vegetation and form, if relevant
- any impoundments (e.g. dams, levees, weirs etc.) and permanent or temporary structures in permanent or ephemeral waterways
- hydrology of waterways
- sustainability, including both quality and quantity
- dependent ecosystems
- existing and other potential surface water users
- water resource plans relevant to the affected catchments.

Groundwater

A groundwater assessment is to be undertaken if the project is likely to use or affect local sources of groundwater. The assessment must describe groundwater resources in the area in terms of:

- geology/stratigraphy
- aquifer type—such as confined, unconfined
- depth to and thickness of the aquifers
- depth to water level and seasonal changes in levels
- groundwater flow directions (defined from water level contours)
- interaction with surface water
- possible sources of recharge
- potential exposure to pollution
- current access to groundwater resources in the form of bores, springs and ponds (including quantitative yield of water and locations of access).

The groundwater assessment should also be consistent with relevant guidelines for the assessment of acid sulfate soils.

Review the quality, quantity and significance of groundwater in the project area, together with groundwater use in neighbouring areas. Refer to relevant legislation or water resource plans for the region. The review should also provide an assessment of the potential take of water from the aquifer and how current users, the aquifer itself and any connected aquifers will be affected by the take of water.

The review should identify existing groundwater supply facilities (bores, wells, or excavations). The information to be gathered for analysis is to include:

- location
- pumping parameters
- drawdown and recharge at normal pumping rates
- seasonal variations (if records exist) of groundwater levels.

5.4.2 Potential impacts and mitigation measures

Assess the potential impacts of the project on water resource environmental values identified in the previous section. Also, define and describe the objectives and practical measures for protecting or enhancing water resource environmental values, to describe how nominated quantitative standards and indicators may be achieved, and how the achievement of objectives will be monitored, audited and managed. Include the following:

- potential impacts on the flow and the quality of surface and groundwater from all phases of the project, with reference to their suitability and accessibility for the current and potential downstream uses and discharge licences
- an assessment of all likely impacts on groundwater depletion or recharge regimes
- potential impacts of surface water flow on existing infrastructure, with reference to the EPP (Water) and the Water Act

- chemical and physical properties of any wastewater (including stormwater at the point of discharge into natural surface waters), and the toxicity of effluent to flora and fauna
- potential impacts on other downstream receiving environments, if it is proposed to discharge water to a riverine system
- an assessment of the potential to contaminate surface and groundwater resources and measures to prevent, mitigate and remediate such contamination.

Strategies should be adequately detailed to demonstrate best practice management and that environmental values of receiving waters will be maintained to nominated water quality objectives. Describe the monitoring programs that will assess the effectiveness of management strategies for protecting water resources during the construction, operation and decommissioning of the project. Outline how these strategies are incorporated into appropriate sections of the EMP.

Surface water and water courses

Describe the hydrology of the area and the adjacent catchments of the rivers and the associated freshwater flows within the study area in terms of water levels and discharges. Describe inter-annual variability and details of historical and predicted floods including extent, levels and frequency.

Describe the potential changes to the hydrodynamic processes and local sedimentation resulting from the construction and operation of the project. This should include:

- impacts on water levels
- changes to sediment transport patterns, including the potential of the proposal to impact on bank erosion and/or bed degradation within adjacent waterways
- changes to flooding levels and frequencies both upstream and downstream of the project. If flooding levels will be affected, modelling of afflux should be provided and illustrated with maps
- potential impacts of in-stream works on hydrology and water quality and proposed measures for avoiding or mitigating the impacts and stabilising and rehabilitating any works
- an assessment of the requirements of the relevant water resource plans for sourcing of water supply for the project
- details of the design of crossings for watercourses sufficient to determine the level of approval required under the Water Act
- if a major re-alignment resulting in diversion and a licence to interfere is required then the diversion must be designed, constructed and monitored in accordance with the following ACARP reports relative to stream diversions within the Bowen Basin:
 - Project C8030 (Stage 1)—Maintenance of Geomorphic Processes in Bowen Basin River Diversions
 - Project C9068 (Stage 2)—Monitoring Geomorphic Processes in Bowen Basin River Diversions
 - Project C9068 (Stage 3)—Design and Rehabilitation Criteria for Bowen Basin River Diversions

- The guideline entitled *Watercourse Diversions—Central Queensland Mining Industry* dated 15 March 2011 (Department of Environment and Resource Management 2011f).

This assessment should also refer to potential impacts associated with extreme events and will relate to the flood study required in Part B, Section 5.1.1 of this TOR.

Discuss the need or otherwise for any approvals under the Water Act in relation to interference with water courses.

Describe the regulatory requirements under the Water Act and SPA that may be required for the access to water supply. Detail the volumetric water requirements of the project, as well as any investigation work required to determine the availability of the supply, and the proposed construction works required for water supply. The capacities of any storage to be constructed to capture water for water supply should also be included within this section.

Wastewater treatment

Reference should be made to the properties of the land disturbed and processing liquid wastes, the technology for settling suspended clays from contaminated water, and the techniques to be employed to ensure that contaminated water is contained and successfully treated on the site.

In relation to water supply and usage, and wastewater disposal, discuss anticipated flows of water to and from the proposal area. Where dams, weirs or ponds are proposed, investigate the effects of predictable climatic extremes (storm events, floods and droughts) on:

- the capacity of the water storages (dams, weirs, ponds) and the ability of these storages to retain contaminants
- the structural integrity of the containing walls
- relevant operating regime
- the quality of water contained
- flows and quality of water discharged.

The design of all water storage facilities should follow the technical guidelines on site water management.

Discuss the mitigation options and the effectiveness of mitigation measures, with particular reference to sediment, acidity, salinity and other emissions of a hazardous or toxic nature to human health, flora or fauna.

Groundwater

Include an assessment of the potential environmental impact caused by the project (and its associated project components) to local groundwater resources, including the potential for groundwater-induced salinity.

The impact assessment should define the extent of the area within which groundwater resources are likely to be affected by the proposed operations and the significance of the project to groundwater depletion or recharge.

Describe the proposed management options available to monitor and mitigate these effects. In particular, state the proposed methods and the feasibility of those methods to 'make good' any adverse affects on the groundwater resources utilised by adjacent landholders.

Describe the response of the groundwater resource to the progression and final cessation of the project, particularly in relation to the recharge potential of aquifers affected by the project.

Describe the response of the groundwater resource to the progression and finally cessation of the proposal.

Assess the impact of the project on the local groundwater regime caused by the altered porosity and permeability of any land disturbance.

Assess and describe any potential for the project to impact on groundwater-dependent vegetation; describe avoidance and mitigation measures.

5.5 Coastal environment

Describe the existing coastal environment that may be affected by the project in the context of coastal values identified in the Queensland State of the Environment reports and environmental values as defined by the EP Act and environmental protection policies.

Identify actions associated with the project that are assessable development within the coastal zone and will require assessment under the provisions of the Coastal Protection and Management Act.

Assess the project's consistency with the relevant policies of the *Queensland Coastal Plan*, including the State Planning Policy: Coastal Protection (Department of Environment and Resource Management 2011d) and the State Policy: Coastal Management (Department of Environment and Resource Management 2011e).

5.5.1 Water quality

Description of environmental values

Provide baseline information on water quality of coastal waters that could be affected by run-off from the project. This information should include (but is not necessarily be limited to) general physical chemical water quality parameters such as dissolved oxygen, pH, heavy metals, nutrients, temperature, salinity, oil in water and turbidity. For coastal areas potentially affected by sediment run-off, suspended solids concentration and Secchi depth should also be included. Discuss the interaction of freshwater flows with coastal waters and the significance of this in relation to marine flora and fauna adjacent to the project area.

Describe the environmental values of coastal waters in the affected area in terms of:

- variability associated with the local wind climate, seasonal factors, freshwater flows and extreme events
- values identified in the EPP (Water) 2009.

Potential impacts and mitigation measures

Define and describe the water quality objectives and practical measures for protecting, mitigating or enhancing coastal environmental values. This includes how nominated quantitative standards and indicators may be achieved, and how the achievement of the water quality objectives will be monitored, audited and managed. The potential environmental harm caused by the project on coastal resources and processes shall be described in the context of controlling such effects.

State Planning Policy 2/02: Planning and Managing Development Involving Acid Sulfate Soils (Department of Natural Resources and Mines & Department of Local Government and Planning 2002a) should be addressed, as should the *Queensland Coastal Plan* and the *Fish Habitat Guideline FHG 002—Restoration of fish habitats: fisheries guidelines for marine areas* (Hopkins, White & Clarke 1998).

Specific issues to be addressed include:

- the water quality objectives used (including how they were developed), and how predicted activities will meet these objectives (refer to the *Queensland Water Quality Guidelines 2009* (Department of Environment and Resource Management 2009b) and *The Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand 2000)
- potential threats to the water quality and sediment quality of the coastal environment, specifically associated with constructing and operating the facilities.

This assessment shall consider, as a minimum:

- potential accidental discharges of contaminants during construction and operation of the project
- stormwater run-off from the project facilities and associated infrastructure
- flooding of relevant river systems and other extreme events.

Describe strategies for protecting Ramsar wetlands; and discuss any obligations imposed by state or Commonwealth legislation or policy, or international treaty obligations (i.e. JAMBA, CAMBA and ROKAMBA).

5.6 Air quality

5.6.1 Description of environmental values

Describe the existing air quality that may be affected by the project in the context of environmental values as defined by the EP Act and Environmental Protection (Air) Policy 2008 (EPP (Air)).

Discuss the existing air shed environment, both local and regional, including:

- background levels and sources of particulates, gaseous and odorous compounds
- pollutants, including greenhouse gases, that may be generated by the project
- baseline monitoring results that are representative of the nearest sensitive receptors

- data on local meteorology and ambient levels of pollutants. This is needed to provide a baseline for later studies or for the modelling of the project's potential influence on air quality and risk of causing environmental harm.

Local meteorological parameters should include air temperature, wind speed and direction, atmospheric stability, mixing depth and other parameters necessary for input to the models.

5.6.2 Potential impacts and mitigation measures

Consider the following to assist in documenting the air quality issues associated with the project and their mitigation:

- an inventory of air emissions from the project expected during construction and operational activities
- 'worst case' emissions that may occur during operation. If these emissions are significantly higher than those for normal operations, it will be necessary to separately evaluate the worst-case impact to determine whether the planned buffer distance between the facility and neighbouring sensitive receptors will be adequate
- ground level predictions should be made at any site that is subject to the requirements of the EPP (Air), including any sites that could be sensitive to the effects of predicted emissions
- dust generation from construction activities, especially in areas where construction activities are adjacent to existing road networks or are in close proximity to sensitive receivers
- climatic patterns that could affect dust generation and movement
- vehicle emissions and dust generation along major haulage routes both internal and external to the project site
- potential for project emissions, including coal dust emissions during operation of the line, to cause impacts on dust sensitive places, terrestrial flora and fauna, and other natural values.

Detail the mitigation measures together with proactive and predictive operational and maintenance strategies that could be used to prevent and mitigate impacts.

Discuss potential air quality impacts from emissions, with reference to the National Environmental Protection (Ambient Air Quality) Measure 2003 (Cwlth) and the EPP (Air). If an emission is not addressed in these legislative instruments, the emission should be discussed with reference to its risk to human health, including appropriate health-based guidelines/standards.

To ensure that all relevant coal rail-transport related dust mitigation measures are implemented to support the project, the proponent should consult with QR National's subsidiary QR Network Pty Ltd to determine the requirements for new coal-loading facilities, load controls and spray-on coal dust suppressant systems as a result of the implementation of the *Coal Dust Management Plan* (QR Network 2010).

5.7 Greenhouse gas emissions

5.7.1 Description of environmental situation

Provide an inventory of projected annual emissions for each relevant greenhouse gas, with total emissions expressed in 'CO₂ equivalent' terms for the following categories:

- Scope 1 emissions—means direct emissions of greenhouse gases from sources within the boundary of the facility and as a result of the facility's activities
- Scope 2 emissions—means emissions of greenhouse gases from the production of electricity, heat or steam that the facility will consume, but that are physically produced by another facility

Briefly describe method(s) by which estimates were made.

The Australian Government Department of Climate Change and Energy Efficiency's *National Greenhouse Accounts (NGA) Factors* (Commonwealth of Australia 2010) can be used as a reference source for emission estimates and supplemented by other sources where practicable and appropriate. As a requirement of the NGA factors, estimates should include the loss of carbon sink capacity of vegetation due to clearing and impoundment.

5.7.2 Potential impacts and mitigation measures

Discuss the potential for greenhouse gas abatement measures, including:

- the proposed measures (alternatives and preferred) to avoid and/or minimise direct greenhouse gas emissions
- how the preferred measures minimise emissions and achieve energy efficiency
- any opportunities to further offset greenhouse gas emissions through indirect means including sequestration and carbon trading.

5.8 Noise and vibration

5.8.1 Description of environmental values

Describe the existing noise and vibration environment that may be affected by the project in the context of the environmental values defined by the EP Act and the Environmental Protection (Noise) Policy 2008. The *Queensland Rail Code of Practice for Railway Noise Management* (Queensland Rail 2007) and *Noise Measurement Manual* (Environmental Protection Agency 2000) should be considered and reference should be made to the *EPA Guideline Noise and Vibration from Blasting* (Environmental Protection Agency 2006).

Identify sensitive noise receptors adjacent to all project components and estimate typical background noise and vibration levels based on surveys at representative sites. Discuss the potential sensitivity of such receptors and nominate performance indicators and standards.

5.8.2 Potential impacts and mitigation measures

Describe the impacts of noise and vibration generated during the construction and operational phases of the project. Noise and vibration impact analysis should include:

- the levels of noise and vibration generated, including noise contours, assessed against the performance indicators and standards nominated in Section 5.8.1 of this TOR, using modelling where appropriate
- impact of noise including low frequency noise (noise with components below 200 Hz) and vibration at all potential sensitive receivers (e.g. residences, social and public infrastructure, such as health, recreational and educational facilities, roads, etc) compared with the performance indicators and standards nominated above
- potential for the project to impact on terrestrial and/or aquatic fauna
- proposals to minimise or eliminate these effects, including details of any screening, lining, enclosing or bundling of facilities, or timing schedules for construction and operations that would minimise environmental harm and environmental nuisance from noise and vibration.
- options for sensitive receivers that are otherwise unable to achieve a satisfactory internal noise level for the preservation of health and wellbeing as identified within the EPP (Noise).

Refer to the following documents in addition to those mentioned in Section 5.8.1 of this TOR document:

- *Noise Measurement Manual* (Environment Protection Agency 2000)
- *Guideline: Noise and vibration from blasting* (Environmental Protection Agency 2006)
- *Guideline: Planning for Noise Control* (Environmental Protection Agency 2004)
- *Australian Standard AS 2187.2-2006 Explosives – Storage and Use, Part 2 Use of Explosives* (Standards Australia 2006).

5.9 Waste

5.9.1 Waste generation

Identify and describe all sources, likely volumes and quality (where applicable) of waste associated with construction, operation and decommissioning of all aspects of the project (refer to regulated waste listed in Schedule 7 of the Environmental Protection Regulation 2008), including:

- waste generated by delivery of material to site(s)
- all chemical and mechanical processes conducted on the construction sites that produce waste
- the amount and characteristics of solid and liquid waste produced on site by the project
- hazardous materials to be stored and/or used on site, including environmental toxicity data and biodegradability.

5.9.2 Waste management

Assess the potential impact of all wastes generated during construction and operation, with regard for best practice waste management strategies, the Environmental Protection (Waste) Policy 2000 and the Environmental Protection (Waste) Regulation 2000. Provide details of each waste in terms of:

- the options available for avoidance/minimisation
- operational handling and fate of all wastes including storage
- on-site treatment methods proposed for any wastes
- methods of disposal (including the need to transport wastes off site for disposal) proposed to be used for any trade wastes, liquid wastes and solid wastes
- the potential level of impact on environmental values
- measures to ensure stability of the waste storage areas and impoundments
- methods to prevent seepage and contamination of groundwater from stockpiles and/or storage areas and impoundments
- measures to minimise attraction of vermin, insects and pests
- options available for using recycled materials
- market demand for recyclable waste (where appropriate)
- decommissioning of the construction site.

5.10 Transport

Present the transport assessment in separate reports for each project-affected mode (road, rail, air and sea) as appropriate. These assessment reports should provide sufficient information to allow an independent assessment of how existing transport infrastructure will be affected by project transport at the local and regional level.

5.10.1 Existing infrastructure

Describe the extent, condition and capacity of the existing transport infrastructure on which the project will depend.

Describe the location of relevant transport services and utilities within the study corridor and locations of existing access points to these services.

5.10.2 Transport tasks and routes

Describe:

- expected volumes of project inputs and outputs to be transported (including raw materials, wastes, hazardous goods and finished products) for all phases of the project
- how identified project inputs and outputs will be moved through the local and regional transport network (including traffic volume, mode, composition, trip timing, sources and routes for haulage of project inputs and materials)
- traffic generated by construction and operation workforce personnel including visitors for all phases of the project (including volume, composition, likely location of accommodation, timing and routes)

- likely heavy and oversize/indivisible loads (volume, composition, timing and routes), highlighting any vulnerable bridges and structures along proposed routes.

5.10.3 Potential impacts

Impact assessment reports should include details of the adopted assessment methodology (for impacts on roads: the road impact assessment report in general accordance with the *Guidelines for Assessment of Road Impacts of Development* (Department of Main Roads 2006)).

Assess project impacts on:

- capacity, safety, local amenity, efficiency and condition of transport operations, services and assets (from either transport or project operations)
- possible interruptions to transport operations, including impacts on the road network during the project construction phase
- local and state-controlled road networks, including key road and road/rail intersections, for all project phases. Any impact to level crossings should be assessed using the Australian Level Crossing Assessment Model (ALCAM)
- road safety with reference to the *Queensland Road Safety Action Plan 2010-2011 Safe4life*
- the natural environment within the jurisdiction of an affected transport authority (e.g. road and rail corridors)
- the nature and likelihood of product-spill during transport, if relevant
- driver fatigue for workers travelling to and from regional centres and key destinations
- any existing or proposed strategies for public passenger transport and active transport and address, where relevant, requirements of Part 2A of the *Transport Planning and Coordination Act 1994* (Qld)
- access to transport for people with a disability.

5.10.4 Infrastructure alterations

Detail:

- any proposed alterations or new transport-related infrastructure and services required by the project (as distinct from impact mitigation works)
- construction of any project-related plant and utilities, within or impacting on the jurisdiction of any transport authority.

5.10.5 Transport management strategies and mitigation measures

Discuss and recommend how identified impacts will be mitigated so as to maintain safety, efficiency and condition of each mode. These mitigation strategies are to be prepared in close consultation with relevant transport authorities (including the Queensland Police Service) and consider those authorities' works programs and forward planning.

Findings of studies and transport infrastructure impact assessments should be an input into preparing a transport management plan.

Road/rail management planning

Outline:

- procedures for assessing and agreeing on the scope of required mitigation works with road/rail corridor managers, including any associated works, such as sourcing water and gravel
- strategies to minimise the effects of project transport on existing and future public road or rail corridors
- steps to be taken to prevent access from public roads/rail corridors to the project sites
- strategies to maintain safe access to public road/rail reserves to allow road/rail/pipeline maintenance activities
- process for decommissioning any temporary access to road/rail reserves, e.g. stockpile sites.

Findings of studies and transport infrastructure impact assessments should be an input into preparing a draft road-use management plan. Conditions of approval for transport management impacts should also be detailed in the EMP.

Air services

Describe the air services and their current capacity serving the region. Estimate the project's requirements for air transport to and from these regions, and the services required to supply these projections. Provide an assessment of the infrastructure needed to support the projected level of air services.

5.11 Indigenous cultural heritage

5.11.1 Description of existing Indigenous cultural heritage values

Subject to any legislated confidentiality provisions, describe the existing Indigenous cultural heritage values that may be affected by the project, including significant Indigenous objects and significant Indigenous areas, and the environmental values of the cultural landscapes of the affected area in terms of the physical and cultural integrity of the landforms.

Also describe how, in conjunction with the appropriate Indigenous people, the cultural heritage values were ascertained. This could include:

- the results of any Aboriginal cultural heritage survey undertaken
- the Aboriginal Cultural Heritage Register and Database (as previously administered by the Department of Environment and Resource Management)
- any existing literature relating to Indigenous cultural heritage in the project area.

5.11.2 Potential impacts and mitigation measures

Define and describe the objectives and practical measures for protecting or enhancing Indigenous cultural heritage environmental values. Describe how nominated quantitative standards and indicators may be achieved for cultural heritage

management, and describe how the achievement of the objectives will be monitored, assessed and managed.

To the greatest extent practicable, significant cultural heritage areas should be avoided by the project. The EIS should provide an assessment of likely effects on sites of Indigenous cultural heritage value, including but not limited to the following:

- description of the significance of artefacts, items or places of conservation or cultural heritage values likely to be affected by the project and their values at a local, regional and national level
- recommended means of mitigating any negative impact on cultural heritage values and enhancing any positive impacts.

As a minimum, impact assessment, management and protection strategies should satisfy statutory responsibilities and duties of care.

During the EIS process, the proponent should initiate a native title agreement (NT agreement), as defined under the *Aboriginal Cultural Heritage Act 2003* (Qld) (ACH Act) that includes management and protection strategies for Indigenous cultural heritage or a cultural heritage management plan (CHMP) under the ACH Act. An NT agreement or an approved CHMP, in a form which complies with Part 7 of the ACH Act, will ensure that the project meets the Aboriginal cultural heritage duty of care imposed by the ACH Act.

If an NT agreement is not finalised or a CHMP has not been approved when the EIS is submitted to the Coordinator-General, the following must be provided:

- an outline of the draft CHMP or draft plan within the NT agreement that addresses management and protection strategies for cultural heritage, subject to any confidentiality provisions, outlining the position of the relevant parties
- details of the proposed steps and timeframes for finalising the CHMP or NT agreement.

An NT agreement or CHMP should be negotiated between the proponent and the appropriate native title/Indigenous parties and should address and include the following:

- a process for including Indigenous people associated with the development areas in protection and management of Indigenous cultural heritage
- processes for mitigating, managing and protecting identified cultural heritage sites and objects in the project areas, including associated infrastructure developments, during both the construction and operational phases of the project
- provisions for managing the accidental discovery of cultural material, including burials
- a clear recording process to assist initial management and recording of accidental discoveries
- a cultural heritage induction for project staff

- developing a cultural heritage awareness program to be incorporated into the contractor/employee manual and induction manual. This is to be in the form of a plain language, short document that is easy for contractors and staff 'on the ground' to understand
- a conflict resolution process.

5.11.3 Native title

Identify areas covered by applications for native title claims or native title determinations, providing boundary descriptions of native title representative body(ies), and whether it is necessary to notify the representative body(ies) or if there is evidence that native title does not exist.

Identify the potential for native title rights and interests likely to be impacted upon by the project and the potential for managing those impacts by an Indigenous land use agreement or other native title compliance outcomes.

5.12 Non-Indigenous cultural heritage

5.12.1 Description of existing non-Indigenous cultural heritage values

Include a systematic non indigenous cultural study that describes non-indigenous cultural heritage sites and places, and their values over the project footprint. Desktop analysis and consultation should determine what level of field survey is necessary to confirm and assess expected heritage occurrences. Any such study should be conducted by an appropriately qualified cultural heritage practitioner and should include the following:

- consultation with:
 - the Australian Heritage Places Inventory
 - the Queensland Heritage Register and other information regarding places of potential non-Indigenous cultural heritage significance
 - any local government heritage register
 - any existing literature relating to the heritage of the affected areas
- liaison with relevant community groups/organisations (e.g. local historical societies) concerning:
 - places of non-Indigenous cultural heritage significance
 - opinion regarding significance of any cultural heritage places located or identified
- locations of culturally and historically significant sites, shown on maps, that are likely to be impacted by the project
- a constraints analysis of the proposed development area to identify and record non-Indigenous cultural heritage places.

5.12.2 Potential impacts and mitigation measures

Provide an assessment of any likely effects on sites of non-Indigenous cultural heritage values, including but not limited to the following:

- description of the significance of artefacts, items or places of conservation or non-Indigenous cultural heritage value likely to be affected by the project and their values at a local, regional, state and national level
- recommended means of mitigating any negative impacts on non-Indigenous cultural heritage values and enhancing any positive impacts
- strategies to manage places of historic heritage significance, taking account also of community interests and concerns.

As a minimum, investigation, consultation, impact assessment, management and protection strategies should satisfy statutory responsibilities and duties of care, including those under the *Queensland Heritage Act 1992*.

6. Social values and management of impacts

6.1 Description of existing social values

The social impact assessment (SIA) should be conducted in consultation with the Significant Projects Coordination Branch of the Coordinator-General's office. Matters to be considered include the social and cultural area, community engagement, a social baseline study, a workforce profile, potential impacts and mitigation measures and management strategies.

6.1.1 Social and cultural area

The SIA should define the project's social and cultural area of influence, including the local, district, regional and state level as relevant, taking into account the:

- potential for social and cultural impacts to occur
- location of other relevant proposals or projects
- location and types of physical and social infrastructure, settlement and land use patterns
- social values that might be affected by the project (e.g. integrity of social conditions, visual amenity and liveability, social harmony and wellbeing, and sense of community)
- Indigenous social and cultural characteristics, such as native title rights and interests, and cultural heritage.

6.1.2 Community engagement

Consistent with national and international good practice, the proponent should engage at the earliest practical stage with likely affected parties to discuss and explain the project, and to identify and respond to issues and concerns regarding social impacts.

Detail the community engagement processes used to conduct open and transparent dialogue with stakeholders. This dialogue should include the project's planning and design stages and future operations including affected local and state authorities. Engagement processes will involve consideration of social and cultural factors, customs and values, and relevant consideration of linkages between environmental, economic, and social impact issues.

6.1.3 Social baseline study

A targeted baseline study of the people residing in the project's social and cultural area is required to identify the project's critical social issues, potential adverse and positive social impacts, and strategies and measures developed to address the impacts. The social baseline study should be based on qualitative, quantitative, and participatory methods. It should be supplemented by community engagement processes, and reference relevant data contained in local and state government publications, reports, plans, guidelines and documentation, including regional plans and, where available, community plans.

The social baseline study should describe and analyse a range of demographic and social statistics determined relevant to the project's social and cultural area including:

- major population trends/changes that may be occurring irrespective of the project
- non-resident workforce
- total population (the total enumerated population for the social and cultural area and the full-time equivalent transient population), 18 years and older
- estimates of population growth and population forecasts resulting from the proposal
- family structures
- age and gender distributions
- education, including schooling levels
- health and wellbeing measures
- cultural and ethnic characteristics
- the Indigenous population including age and gender
- income including personal and household
- labour force by occupation and industry
- housing costs (monthly housing repayments (per cent of dwellings in each category), and weekly rent (per cent dwellings in each category), housing tenure type and landlord type, household and family type
- housing availability and affordability: the rental market (size, vacancy rate, seasonal variations, weekly rent by percentage dwellings in each category); the availability and typical costs of housing for purchase, monthly housing repayments by percentage dwellings in each category; and the availability of social housing
- disability prevalence
- the social and economic index for areas, index of disadvantage—score and relative ranking
- crime, including domestic violence
- any other indicators determined as relevant through the community engagement process.

The social baseline study should take account of current social issues such as:

- the social infrastructure including community and civic facilities, services and networks—for definition see *South East Queensland Regional Plan 2005–2026*:

Implementation Guideline No.5: Social infrastructure planning (Department of Infrastructure 2007)

- settlement patterns including the names, locations, size, history and cultural aspects of settlement in the social and cultural area
- the identity, values, lifestyles, vitality, characteristics and aspirations of communities in the social and cultural area, including Indigenous communities
- land use and land ownership patterns including:
 - rural properties, farms, croplands and grazing areas including on-farm activities near the proposed activities
 - the number of properties directly affected by the project
 - the number of families directly and indirectly affected by the project including Indigenous traditional owners and their families, property owners, and families of workers either living on the property or workers where the property is their primary employment.
- use of the social and cultural area for forestry, fishing, recreation, business and industry, tourism, aquaculture, and Indigenous cultural use of flora and fauna.

6.1.4 Workforce profile

The SIA should include a profile of the workforce that describes the:

- workforce demand:
 - the estimated composition of workforce by occupation, project stage and duration (including any planned construction prior to final investment decision) using the template provided at **www.skills.qld.gov.au**
 - projected non-resident workforce
- supply issues and strategies:
 - analysis of relevant local, state and national workforce profiles and labour supply
 - strategies and proposed programs for:
 - o recruitment and attraction
 - o population groups (including Indigenous, women, secondary school students and unemployed and underemployed)
 - o unskilled and semi-skilled labour requirements
 - o structured training (apprenticeships, traineeships, graduates)
 - o analysis of impact on local community workforce

The fact sheet provided on Skills Queensland's website **www.skills.qld.gov.au** provides essential information, contact and relevant program details for the development of the workforce management plan.

6.2 Potential impacts

Assess and describe the type, level and significance of the project's social impacts (both beneficial and adverse) on the local and cultural area, based on outcomes of community engagement processes and the social baseline study. Furthermore:

- describe and summarise outcomes of community engagement processes including the likely response of the affected communities, including Indigenous people
- include sufficient data to enable affected local and state authorities to make informed decisions about the project's effect on their business and plan for the provision of social infrastructure in the project's social and cultural area. If the project is likely to result in a significant increase in the population of the area, then the proponent should consult the relevant management units of the state authorities and summarise the results of the consultations
- address direct, indirect and secondary impacts from any existing projects and the proposed project including an assessment of the size, significance, and likelihood of these impacts at the local and regional level. Consider the following:
 - key population/demographic shifts; disruptions to existing lifestyles, the health and social wellbeing of families and communities; social dysfunction including alcohol and drugs, crime, violence, and social or cultural disruption due to population influx
 - the needs of vulnerable groups including women, children and young people, the aged and people with a disability
 - Indigenous peoples including cultural property issues
 - local, regional and state labour markets, with regard to the source of the workforce. Present this information according to occupational groupings of the workforce. Detail whether the proponent, and/or contractors, is likely to employ locally or through other means and whether there are initiatives for local employment business opportunities
 - proposed new skills and training related to the project including the occupational skill groups required and potential skill shortages anticipated
 - how much service revenue and work from the project would be likely to flow to the project's social and cultural area
 - impacts of construction and operational workforces, their families, and associated contractors on housing and accommodation availability and affordability, land use and land availability. Discuss the capability of the existing housing and rental accommodation, to meet any additional demands created by the project, including direct impacts on Indigenous people.

Evaluate and discuss the potential cumulative social impacts resulting from the project including an estimation of the overall size, significance and likelihood of those impacts. In this context, 'cumulative impacts' is defined as the additional impacts on population, workforce, accommodation, housing, and use of community infrastructure and services, from the project, and other proposals for development projects in the area, which are publicly known or communicated by the Coordinator-General, if they overlap the proposed project in the same timeframe as its construction period.

6.2.1 Mitigation measures and management strategies

For identified social impacts, social impact mitigation strategies and measures should be presented to address the:

- recruitment and training of the construction and operational workforces and the social and cultural implications this may have for the host community, including if any part of the workforce is sourced from outside the social and cultural area
- housing and accommodation issues—the Major Resource Projects Housing Policy (Department of Employment, Economic Development and Innovation 2011b) sets out the core principles to guide the identification and assessment of accommodation and housing impacts and development of mitigation and management strategies
- demographic changes in the profile of the region and the associated sufficiency of current social infrastructure, particularly health and welfare, education, policing and emergency services
- adequate provision of education, training and employment for women, people with a disability, and Indigenous peoples.

Describe any consultation about acceptance of proposed mitigation strategies and how practical management and monitoring regimes are proposed to be implemented.

6.2.2 Social impact management plan

Present a draft social impact management plan (SIMP) that promotes an active and ongoing role for impacted communities and local authorities through the project life cycle. The draft plan should cover:

- assignment of accountability and resources
- updates on activities and commitments
- mechanisms to respond to public enquiries and complaints
- mechanisms to resolve disputes with stakeholders
- periodic evaluation of the effectiveness of community engagement processes
- practical mechanisms to monitor and adjust mitigation strategies and action plans
- action plans to implement mitigation strategies and measures.

For further information on preparing the SIMP, refer to *Social impact assessment: Guideline to preparing a social impact management plan* (Department of Infrastructure and Planning 2010).

7. Economies and management of impacts

7.1 Economy

7.1.1 Description of affected local and regional economies

Describe the existing economy in which the project is located and the economies materially impacted by the project. Include:

- a map illustrating the local and regional economies (local government areas) that could be potentially affected by the project
- gross regional product or other appropriate measure of annual economic production
- population
- labour force statistics

- the regional economy's key industries and their contribution to regional economic activity
- the key regional markets relevant to the project:
 - labour market
 - housing and land markets
 - construction services and building inputs market
 - regional competitive advantage and expected future growth.

With regard to the region's key industries and factor prices, provide information on:

- current input costs (wage rates, building costs, housing rent etc.)
- land values in the region by type of use.

7.1.2 Potential impacts and mitigation measures

The potential impacts should consider local, regional, state and national perspectives as appropriate to the scale of the project.

The analysis should describe both the potential and direct economic impacts including estimated costs, if material, on industry and the community, assessing the following:

- property values
- industry output and/or other relevant measure of industry activity
- employment
- the potential impact on extractive resource availability in the region both during and after construction and any economic consequences for the region
- the indirect impacts likely to flow to other industries and economies from the development of the project. This should also consider the implications of the project for future development
- the distributional effects of the proposal including proposals to mitigate any negative impact on disadvantaged groups.

Strategies for local participation

The assessment of economic impacts should outline strategies for local participation, including:

- strategies for sourcing local inputs from the regional economy during the construction, operation and rehabilitation phases of the project
- employment strategies for local residents including members of Indigenous communities and people with a disability, including a skills assessment and recruitment and training programs to be offered
- strategies responding to relevant government policy, relating to developing a local industry participation plan under the Local Industry Policy (Department of Employment, Economic Development and Innovation 2010) in conjunction with the DSDIP Office of Advanced Manufacturing, to embrace the use of locally sourced goods and services—see the *Local Industry Policy Guidelines* (Department of Employment, Economic Development and Innovation 2011a).

Impact upon property management

Address the current and future management processes for adjacent properties that are likely to be impacted by the project during construction and/or operation. Mention the:

- impact of the project on existing agricultural land uses and management practices (e.g. disruption to stockyards, fences, water points, sowing or harvesting of crops, movement of livestock, agricultural machinery and any loss of agricultural land)
- range of measures required to mitigate real and potential disruptions to rural practices and management of properties.

7.2 Sustainable development

Provide a comparative analysis of how the project conforms to the objectives for 'sustainable development'—see the *National Strategy for Ecologically Sustainable Development* (Commonwealth of Australia 1992).

Consider the cumulative impacts (both beneficial and adverse) of the project from a life-of-project perspective, taking into consideration the scale, intensity, duration and frequency of the impacts to demonstrate a balance between environmental integrity, social development and economic development.

This information is required to demonstrate that sustainable development aspects have been considered and incorporated during the scoping and planning of the project.

8. Hazard and risk

8.1 Hazard and risk assessment

Describe the potential hazards and risks to people and property that may be associated with the project, which may include but are not restricted to:

- identifying potential hazards, accidents, spillages and abnormal events that may occur during all stages of the project, including possible frequency of occurrence
- identifying possible causes of fire due to construction and maintenance activities of the proposed development and the existing fire hazard severity of the areas on and immediately adjacent to the project site using the State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (Department of Local Government and Planning & Department of Emergency Services 2003), or a similar assessment method
- identifying all hazardous substances to be used, stored, processed or produced and the rate of usage
- potential wildlife hazards, natural events (e.g. cyclone, storm surge, flooding, bush fire) and implications related to climate change.

Undertake a preliminary risk assessment for all components of the project, as part of the EIS process in accordance with *Australia/New Zealand AS/NZS ISO 31000:2009 Risk management—Principles and guidelines* (Standards Australia/Standards New Zealand 2009). With respect to risk assessment, the EIS should:

- deal comprehensively with external and on-site risks including transport risks
- assess risks during the pre-construction, construction, operational and decommissioning phases of the project
- include an analysis of the consequences of each hazard on safety in the project area, examining the likelihood of both individual and collective consequences, involving injuries and fatalities to workers and to the public
- present qualitative levels of risks from the above analysis.

Provide details on the safeguards that would reduce the likelihood and severity of hazards, consequences and risks to persons, within and adjacent to the project area(s).

Present a comparison of assessed and mitigated risks with acceptable risk criteria for land uses in and adjacent to the project area(s).

Provide a draft risk management plan.

8.2 Health and safety

8.2.1 Description of public health and safety community values

Describe the existing health and safety values of the community, workforce, suppliers and other stakeholders in terms of the environmental factors that can affect human health, public safety and quality of life, such as air pollutants, odour, lighting and amenity, dust, noise and water.

8.2.2 Potential impact and mitigation measures

Define and describe the objectives and practical measures for protecting or enhancing health and safety community values. Describe how nominated quantitative standards and indicators may be achieved for social impacts management, and how the achievement of the objectives will be monitored, audited and managed.

Assess the cumulative effects on public health values and occupational health and safety impacts on the community, workforce and regional health services from project operations and emissions. Recommend any practical monitoring regimes in this section.

Include relevant consultation with the appropriate regional health service providers.

8.3 Emergency management plan

The development of emergency and evacuation planning and response procedures is to be determined in consultation with state and regional emergency service providers including the Queensland Police Service, Queensland Ambulance Service, Queensland Fire and Rescue Service and Emergency Management Queensland.

Provide an outline of the proposed integrated emergency management planning procedures (including evacuation plans, if required) The procedures should cover the range of situations identified in the risk assessment developed in this section, including strategies to deal with natural disasters during operation and construction.

Provide information on the design and operation of proposed safety and contingency systems to address Queensland's counter-terrorism and critical infrastructure protection policies and arrangements and an operational security plan.

Present preliminary information on the design and operation of proposed safety/contingency systems to address significant emergency issues delineated in the risk assessment, together with at least the following areas of emergency:

- terrorist attack
- marine collision minimisation, if relevant
- fire prevention/protection (including how project will comply with relevant provisions of the *Fire and Rescue Service Act 1990*)
- leak detection/minimisation
- release of contaminants
- emergency shutdown systems and procedures
- natural disasters.

Describe how the project will comply with relevant provisions of the *Disaster Management Act 2003* (Qld).

In addition, undertake an assessment of businesses that may be affected in the event of an emergency, including strategies to mitigate the impact on these businesses.

In regard to fires, outline strategies to manage the provision of:

- fire management systems to ensure the retention on site of fire water or other fire suppressants used to combat emergency incidents
- building fire safety measures for any construction or permanent accommodation
- details of any emergency response plans and bushfire mitigation plans under the State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide (Department of Local Government and Planning & Department of Emergency Services 2003)
- on-site firefighting equipment provided and the level of training of staff who will be tasked with emergency management activities
- detailed maps showing the plant outline, potential hazardous material stores, incident control points, firefighting equipment, etc.
- an outline of any dangerous goods stores associated with the plant operations, including fuel storage and emergency response plans.

Present outlines of emergency planning and response strategies to deal with relevant incidents above, which have been determined in consultation with state and regional emergency service providers, and which show integration of emergency services into the plans.

Present plans for emergency medical response and transport and first aid matters with involvement of the relevant state agencies (such as the Queensland Ambulance Service, Queensland Fire and Rescue Service and Emergency Management Queensland).

9. Cumulative impacts

Summarise the project's cumulative impacts and describe these impacts in combination with those of existing or proposed project(s) publicly known or advised by the Coordinator-General to be in the region, to the greatest extent practicable. Assess cumulative impacts with respect to both geographic location and environmental values. Explain the methodology used to determine the cumulative impacts of the project, detailing the range of variables considered (including relevant baseline or other criteria upon which the cumulative aspects of the project have been assessed, where applicable). Include consideration of impact on, and by, transport networks.

10. Environmental management plan

Detail the EMP for both the construction and operation phases of the project. The EMP should be developed from, and be consistent with, the information in the EIS. The EMP must address discrete project elements and provide life-of-proposal control strategies. It must be capable of being read as a stand-alone document without reference to other parts of the EIS.

The EMP must comprise the following components for performance criteria and implementation strategies:

- the proponent's commitments to acceptable levels of environmental performance, including environmental objectives, performance standards and associated measurable indicators, performance monitoring and reporting
- impact prevention or mitigation actions to implement the commitments
- corrective actions to rectify any deviation from performance standards
- an action program to ensure the environmental protection commitments are achieved and implemented. This will include strategies in relation to:
 - continuous improvement
 - environmental auditing
 - monitoring
 - reporting
 - staff training
 - a rehabilitation program for land proposed to be disturbed under each relevant aspect of the proposal.

The recommended structure of each element of the EMP is:

Element/issue	Aspect of construction or operation to be managed (as it affects environmental values).
Operational policy	The operational policy or management objective that applies to the element.
Performance criteria	Measurable performance criteria (outcomes) for each element of the operation.
Implementation strategy	The strategies, tasks or action program (to nominated operational design standards) that would be implemented to achieve the performance criteria.

Monitoring	The monitoring requirements to measure actual performance (e.g. specified limits to pre-selected indicators of change).
Auditing	The auditing requirements to demonstrate implementation of agreed construction and operation environmental management strategies and compliance with agreed performance criteria.
Reporting	Format, timing and responsibility for reporting and auditing of monitoring results.
Corrective action	The action (options) to be implemented in case a performance requirement is not reached and the person(s) responsible for action (including staff authority and responsibility management structure).

The proponent's commitments to environmental performance, as described in the EMP, may be included as Coordinator-General's conditions to ensure the commitments are met. Therefore, the EMP is a relevant document for project approvals, environmental authorities and permits, and may be referenced by them.

11. Conclusions and recommendations

Make conclusions and recommendations with respect to the project, based on the studies presented, the EMP and conformity of the project with legislative and policy requirements.

12. References

All references consulted should be presented in the EIS in a recognised format.

13. Appendices

Final TOR for this EIS

Include a copy of the final TOR in the EIS.

TOR cross-reference table

Provide a cross-reference table that links the requirements of each section/subsection of the TOR with the corresponding section/subsection of the EIS, where those requirements have been addressed

Project approvals

Provide a list of the project approvals required by the project as discussed in Section 3.8 of this TOR.

Consultation report

The report should include the methodology used in the public consultation plan including:

- criteria for identifying stakeholders and the communication methods used (the consultation plan)
- a list of stakeholders identified, including the Australian, Queensland and local government agencies, and/or the affected parties (as defined by the EP Act)
- a summary of the issues raised by stakeholders and the means by which the issues have been addressed
- plans for ongoing consultation to be outlined and included in the SIMP.

Study team

List the relevant qualifications and experience of the key study team members and specialist sub-consultants.

Glossary of terms

Provide a glossary of technical terms.

Specialist studies

All reports generated on specialist studies undertaken as part of the EIS are to be included as appendices.

Corporate environmental policy

Attach a copy of the proponent's corporate environmental policy and planning framework document.

List of proponent commitments

Provide a list of all commitments made by the proponent in the EIS, together with a reference to the relevant section in the report.

Acronyms and abbreviations

Acronym/ abbreviation	Definition
ACH Act	<i>Aboriginal Cultural Heritage Act 2003 (Qld)</i>
APSDA	Abbot Point State Development Area
AS/NZS	Australian standard/New Zealand standard
BMA	BHP Billiton Mitsubishi Alliance
BMC	BHP Mitsui Coal
CAMBA	China–Australia Migratory Bird Agreement
CHMP	cultural heritage management plan
DEEDI	The former Department of Employment, Economic Development and Innovation, Queensland (now DSDIP)
DERM	The former Department of Environment and Resource Management, Queensland (now various departments)
DSDIP	Department of State Development, Infrastructure and Planning, Queensland (formerly DEEDI)
EIS	environmental impact statement
EMP	environmental management plan
EP Act	<i>Environmental Protection Act 1994 (Qld)</i>
EPA	former Queensland Environmental Protection Agency
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)</i>
EPP	environmental protection policy (water, air, waste, noise)
ERA	environmentally relevant activity
HTML	hyper text markup language
JAMBA	Japan–Australia Migratory Bird Agreement
MNES	matters of national environmental significance (under the EPBC Act)
MRA	<i>Mineral Resources Act 1989 (Qld)</i>
NC Act	<i>Nature Conservation Act 1992 (Qld)</i>
NGA	National Greenhouse Accounts
NQBP	North Queensland Bulk Ports
NT agreement	native title agreement

PDF	portable document format
QASSIT	Queensland Acid Sulfate Soils Investigation Team
REDD	Regional Ecosystem Description Database
ROKAMBA	Republic of Korea–Australia Migratory Bird Agreement
SDPWO Act	<i>State Development and Public Works Organisation Act 1971</i> (Qld)
SIA	social impact assessment
SPA	<i>Sustainable Planning Act 2009</i> (Qld)
The proponent	BHP Billiton MetCoal Holdings Pty Ltd
TMR	Department of Transport and Main Roads, Queensland
TOR	terms of reference
VM Act	<i>Vegetation Management Act 1999</i> (Qld)

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Appendix 1. Geology and Soils Scope Methodology and Structure

BHP Billiton

Report for Goonyella to Abbot Point Rail Project
Geology and Soils Scope Methodology and Structure

December 2011

23702-D-RP-0008-0

This Report is subject to, and must be read in conjunction with, the limitations set out below and the assumptions and qualifications contained throughout the Report.

This Report has been prepared by GHD Pty Ltd (GHD) for BHP Billiton and may only be used and relied on by BHP Billiton for the purpose agreed between GHD and the BHP Billiton.

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The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was prepared.

The opinions, conclusions and any recommendations in this Report are based on assumptions made by GHD described in this Report. GHD disclaims liability arising from any of the assumptions being incorrect.

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Executive Summary

The BHP Billiton Goonyella to Abbot Point Rail Project (the Project) will involve the construction and operation of a dedicated greenfield rail line and associated infrastructure from the Goonyella Riverside Mine Complex within the Bowen Basin to the Port of Abbot Point. The Project is expected to enable the transport of approximately 60 million tonnes per annum of product coal to a dedicated BHP Billiton terminal at the Port of Abbot Point.

The scope of the soil survey component of the Project includes the study corridor for the Project covering a combined corridor area of 490 km². This study corridor includes two optional route selections:

- D Investigation Corridor covers an area of 367 km²; and
- E Investigation Corridor covers an area of 411 km²

Both corridors range in width from less than 1 km up to 5 km.

The intent of the soil survey is to enable the expected Terms of Reference (ToR) for the Project to be addressed, and to provide the proponent with sufficient information to enable soils related environmental impacts to be identified so that these may be addressed in the detailed planning stage of the Project should it proceed. A summary of the objectives of the soil survey are as follows:

- Undertake an assessment of good quality agricultural land (GQAL) and strategic cropping land (SCL) so that the Proponent, regulators, and the community can appreciate the agricultural land uses that may be impacted by the Project. It is expected that this information will have a strong influence on route selection;
- Identify the different soil types that will require special attention and the development of appropriate management strategies during construction;
- Identify the different landscapes that will require special attention and the development of appropriate management strategies during construction; and
- Undertake a preliminary assessment of the potential for good quality re-usable topsoil, which is vital for when rehabilitation is required, likewise identification of poor quality topsoil requiring amelioration for use in rehabilitation.

The methodology for the soil survey has been developed to enable the aforementioned objectives to be addressed. The soil survey intends to adopt a range of scales dependent upon the expected land suitability of the areas with more detailed surveys in areas of higher agricultural value or more intensive use, in particular good quality agricultural land areas. The key points of the methodology are as follows:

- Potential SCL land included on the SCL trigger maps will be surveyed as recommended in the Protecting Queensland's Strategic Cropping Land – Guidelines for Applying the Proposed Strategic Cropping Land Criteria (DERM, 2011). The scale of surveys will be dependent on whether the lands occurs in the Coastal Queensland or Western Cropping areas;
- Good quality agricultural land will be surveyed at a scale of 1:100 000;
- In areas where existing published soil survey information is available at 1:100 000 scale then no further field work will be conducted other than to assess lands included on the DERM's Statewide Trigger mapping for Strategic Cropping Land;

- ▶ The intensity of ground observations will be conducted in reference to '*Guidelines for Surveying Soil and Land Resources*' (McKenzie *et al* 2008);
- ▶ The proportion of ground observation classes will be more detailed than that recommended in the '*Guidelines for Surveying Soil and Land Resources*' (McKenzie *et al* 2008), with 50-80% of ground observation sites consisting of detailed soil profile descriptions with laboratory analysis being conducted; and
- ▶ Should the EIS be accepted and the Project proceeds, then it is understood by the Proponent that it will be likely conditioned by the Coordinator General that further soil surveying will be undertaken to ensure that detailed survey at a 1:100 000 is available for the whole alignment based on *Draft for Discussion - Soil Survey Methodology along Linear Features* (DERM, 2011). This soil survey will be limited to the then defined Project corridor that is expected to be between 60 m to 100 m wide, and will 'fill in' those areas not already covered with mapping to this scale. The intention of this detailed soil survey will be to delineate to a level of confidence associated with a scale of 1:100 000, the soil types and land uses within the Project alignment so that appropriate management strategies during construction can be applied.

1. Introduction

1.1 Project Background

BHP Billiton, through BHP Billiton MetCoal Holdings Pty Ltd, is investigating the opportunity to secure a strategic logistics supply line for the transport of predominantly metallurgical coal from mine to port. The BHP Billiton Goonyella to Abbot Point Rail Project (the Project) will involve the construction and operation of a dedicated greenfield rail line and associated infrastructure from the Goonyella Riverside Mine Complex within the Bowen Basin to the Port of Abbot Point, servicing a number of potential new mines and expansion projects. The Project is expected to ultimately enable the transport of approximately 60 million tonnes per annum (Mtpa) of product coal from existing and planned BHP Billiton Mitsubishi Alliance (BMA) and BHP Mitsui Coal (BMC) mines within the Bowen Basin for export from the Port of Abbot Point. Servicing BMA and BMC's operations in the Bowen Basin, the Project will have a nominal project life of 100 years, inclusive of construction, operation and decommissioning. Export coal from the Project will largely service the metallurgical coal market. BHP Billiton assets hold around half of the metallurgical coal resources in the Bowen Basin, predominantly in the north, and provide the basis for the Project, which will enable exports from these assets to exceed 100 million tonnes per annum.

The Project will commence adjacent to BMA's existing Goonyella Riverside Mine Complex approximately 24 kilometres (kms) north-north-west of Moranbah in Central Queensland.

Two preliminary investigation corridors have currently been identified during initial Project studies (covering a combined area of 490 km²). The preliminary investigation corridors extend northward, bypassing the town of Collinsville, and continue to the Port of Abbot Point near Bowen, Queensland.

These preliminary investigation corridors will be reviewed and revised as appropriate as part of the EIS for the Project. The EIS will present a nominal rail alignment, which will be developed on the basis of a range of social, cultural, environmental, engineering, cost and operational factors.

There is potential for the final rail alignment to change from the preliminary investigation corridors presented in the Initial Advice Statement (IAS). The final rail alignment selected during the EIS is expected to cover a distance of approximately 250 to 290 kms.

1.2 Scope

The study corridor includes two optional route selections:

- ▶ D Investigation Corridor covers an area of 367 km²; and
- ▶ E Investigation Corridor covers an area of 411 km²

Both corridors range in width from less than 1 km up to 5 km.

The scope of the initial soil investigation covers both D and E investigation corridors.

The Project area is defined as the *investigation corridor* shown on Figure 1, Appendix A.

1.3 Study Objectives

The intent of the soil survey will be to address the expected Terms of Reference (ToR) and to provide the Proponent with sufficient information to enable soil related environmental values, conditions and impacts to be identified. The objectives of the soil survey will be:

- ▶ To complete an assessment of good quality agricultural land (GQAL) and strategic cropping land (SCL) to inform the Proponent, regulators, and the community of existing agricultural land uses that could potentially be impacted by the Project. It is expected that this information will have a strong influence on route selection.
- ▶ Identification of the different soil types that will require special attention and the development of appropriate management strategies during the proposed construction phase. Examples include but are not limited to:
 - cracking clays which have the potential to impact construction schedules due to trafficability hindrances during wet weather;
 - dispersive and unstable soils which require additional provisions for the design of drainage structures and for erosion and sediment control management during construction phase;
 - saline soils which will be typically unsuitable for rehabilitation; and
 - acidic or sodic soils that may require amelioration with lime or gypsum.
- ▶ Identification of the different landscapes that will require special attention and the development of appropriate management strategies during construction. Examples include:
 - low lying areas prone to seasonal water logging. These areas have the potential to impact construction schedules due to trafficability / workability hindrances whilst wet;
 - permanent and ephemeral water courses and drainage lines that require constructability consideration for erosion and sediment control during construction; and
 - areas where moderately inclined to steep lands are present, and/or external catchments that may impact construction and the environmental performance of the Project.
- ▶ Preliminary assessment of the potential for good quality re-usable topsoil. Information from this assessment is vital for the rehabilitation phase of the Project, as is identification of poor quality topsoil, requiring amelioration for use in rehabilitation;
- ▶ Identify potential for resource sterilisation to arise as a result of the Project; and
- ▶ Propose mitigating measures for potential Project impacts.

1.4 Methodology Key Points

The methodology for the soil survey has been developed to enable the objectives to be addressed. The soil survey will adopt a range of scales dependent on the expected land suitability of the areas with more detailed surveys to be undertaken in areas where higher agricultural value or more intensive use, in particular cropping/horticultural areas are present. The key points of the methodology are listed below:

1. Potential SCL land included on SCL trigger maps will be surveyed as recommended in the *Protecting Queensland's Strategic Cropping Land – Guidelines for Applying the Proposed Strategic Cropping Land Criteria* (DERM, 2011). The scale of surveys will be dependent on whether the lands occur in the Coastal Queensland or Western Cropping areas;
2. Good quality agricultural land will be surveyed at a scale of 1:100 000;
3. The intensity of ground observations will be conducted in reference to '*Guidelines for Surveying Soil and Land Resources*' (McKenzie et al 2008);
4. In areas where existing published soil survey is available at an appropriate scale, no further field work is planned other than to assess lands included on the DERM's Statewide Trigger mapping for Strategic Cropping Land. In particular this applies to sections of the Project corridor within the 1:100 000 mapping included in:
 - Soils of the Elliot River – Bowen Area North Queensland (DPI, 1998); and
 - Soils of the Lower Burdekin Valley, North Queensland (DPI, 1990), with the exception of areas included on SCL trigger mapping.

Should the EIS be accepted and the Project proceeds, then it is understood by the Proponent that it will be likely conditioned by the Coordinator General that further soil surveying will be undertaken to ensure that detailed survey at a 1:100 000 is available for the whole alignment based on *Draft for Discussion - Soil Survey Methodology along Linear Features* (DERM, 2011). This soil survey will be limited to the then defined Project corridor that is expected to be between 60 m to 100 m wide, and will 'fill in' those areas not already covered with mapping to this scale. The intention of this detailed soil survey will be to delineate to a level of confidence associated with a scale of 1:100 000, the soil types and land uses within the Project alignment so that appropriate management strategies during construction can be applied.

5. The proportion of ground observation classes will be more detailed than that recommended in the 'Guidelines for Surveying Soil and Land Resources' (McKenzie *et al* 2008), with 50-80% of ground observation sites consisting of detailed soil profile descriptions with laboratory analysis proposed.

1.5 Relevant Legislation

The following describes the main pieces of legislation applicable to the planning, approval, construction and operation of the Project in relation to landform, soils and soil management.

1.5.1 Environmental Protection Act 1994

The *Environmental Protection Act 1994* (EP Act) is the key legislation for environmental management and protection in Queensland. The environmental values of land resources in Queensland are protected under the EP Act. The primary objectives of the EP Act is to protect environmental values and human health whilst allowing developments that improve the quality of life both now and in the future in a manner that maintains ecological processes.

1.5.2 Strategic Cropping Land Bill 2011

On 25 October 2011, the Queensland Government introduced the Strategic Cropping Land Bill 2011 into Parliament and intends to enact the legislation in early 2012.

The purposes of this Act are to:

- ▶ Protect land that is highly suitable for cropping; and
- ▶ Manage the impacts of development on that land; and
- ▶ Preserve the productive capacity of that land for future generations.

This Act commences on the day (the *commencement*) that is the later of the following days —

- (a) the date of assent;
- (b) 30 January 2012.

1.5.3 Protecting Queensland's Strategic Cropping Land: A Policy Framework

The Policy Framework was formulated following a review of State Planning Policy 1/92. Under the framework, legislative and planning instruments will be developed to implement the policy being:

- ▶ The legislation will describe how strategic cropping land is identified and will include an indicative map of where strategic cropping land resources may exist. Criteria will then be used for validating on-site whether the land is in fact strategic cropping land. The legislation will provide a consistent process for assessing and deciding whether development can proceed on strategic cropping land;
- ▶ A new SPP under the Sustainable Planning Act 2009; and
- ▶ Amendments to resources legislation will be made to recognise the requirements of the new Act for strategic cropping land resources.

While the new laws are yet to be enacted, the Government expects that proponents will address the proposed framework in advancing their project(s).

1.5.4 State Planning Policy 1/92

State Planning Policy 1/92 states that Good Quality Agricultural Land (GQAL) has a special importance and should not be built on unless there is an overriding need for the development in terms of public benefit and no other site(s) is suitable for the particular purpose. As defined by *Planning Guidelines: the Identification of Good Quality Agricultural Land* (DPI, 1993), GQAL is 'land which is capable of sustainable use for agriculture, with a reasonable level of inputs, and without causing degradation of land or other natural resources'.

The DPI guidelines also define agricultural land as 'land used for crop or animal production, but excluding intensive animal uses such as feedlots, piggeries, poultry farms and plant nurseries based on either hydroponics or imported growth media'.

SPP 1/92 is largely implemented at the local government level, and requires local governments to include maps of GQAL in their planning schemes.

1.5.5 Planning Guidelines: The Identification of Good Quality Agricultural Land 1993

The planning guidelines assist in the implementation of SPP 1/92, through the provision of a methodology for assessing and identifying agricultural land classes and subsequently GQAL.

Under the planning guidelines, land is classified into classes, ranging from Class A being cropping land with moderate to no production limitations, to Class D being land not suitable for agriculture due to extreme limitations. Which agricultural land classes are considered GQAL within each local government areas was established during the preparation of the planning guidelines in 1993, based on publically available land resource mapping. The planning guidelines acknowledge that much of this mapping is at a broad scale, and that site-specific assessments may be needed to confirm the distribution of GQAL.

2. Methodology

2.1 References and Guidelines

The initial soil study program has been developed in reference to the following guidelines:

- ▶ *Australian Soil and Land Survey: Guidelines for Survey Soil and Land Resources* (McKenzie et al, 2008);
- ▶ *Land Suitability Assessment Techniques* (DME, 1995);
- ▶ *Australian Soil Classification* (Isbell, 2002);
- ▶ *Australian Soil survey and Land Survey Field Handbook* (National Committee on Soil and Terrain, (NCTS) 2009);
- ▶ *Assessment and Management of Contaminated Land in Queensland* (DoE, 1998);
- ▶ *Protecting Queensland's Strategic Cropping Land – Proposed Criteria for Identifying Strategic Cropping Land* (DERM, 2011);
- ▶ *Protecting Queensland's Strategic Cropping Land – Guidelines for Applying the Proposed Strategic Cropping Land Criteria* (DERM, 2011);
- ▶ *Planning Guidelines: the Identification of Good Quality Agricultural Land*. Department of Primary Industries and Department of Housing, Local Government and Planning Queensland, (DPI/DHLGP) 1993); and
- ▶ *Land Resources Survey and Evaluation of the Kilcummin Area, Queensland, Queensland Department of Primary Industries, Land Resources Bulletin QV91001* (Shield, P.G and Williams, B.M (1991)).

2.2 Desktop Assessment

A desktop assessment of the Project alignment will include a review of published and available information regarding soils, land resources, geology, topography, regional ecosystem mapping and aerial imagery.

2.2.1 Existing Soil and Land System Information

The initial task requires establishing existing soil and land system mapping. The Project traverses through areas including six publicly available land system and soil survey reports; which provides information and mapping regarding the dominant soils and landforms. These reports are listed in Table 1 and the areas that they cover are presented in Figure 1 – Published Soil Mapping (Appendix A).

Table 1 Summary of Desktop Sources

Source	Scale
Story, R., Galloway, R.W., Fitzpatrick, E.A., Gunn, R.H. (1967) <i>Lands of the Isaac - Comet Area, Queensland, Land Research Series No.19</i> . Commonwealth Scientific and Industrial Research Organization, Australia, Melbourne, Victoria.	1:500,000 - Land System Reporting
Gunn, R.H., Galloway, R.W., Pedley, L., Fitzpatrick, E.A. (1967). <i>Lands of the Nogoa - Belyando Area, Queensland, Land Research Series No. 18</i> . Commonwealth Scientific and Industrial Research Organization, Australia, Melbourne, Victoria.	1:500,000 - Land System Reporting
Isbell, R.F., Murtha, G.G. (1970). <i>Burdekin - Townsville Region, Queensland, Resource Series, Soils</i> . Geographic Section, Department of National Development, Canberra, Australian Capital Territory.	1:1,000,000 - Soil Mapping and Report
Thompson, W.P., Cannon, M, Reid, R, Baker, D (1990). <i>Soils of the Lower Burdekin Valley, North Queensland - Redbank Creek to Bob's Creek and south to Bowen River</i> . Brisbane: Queensland Department of Primary Industries, Queensland.	1:100,000 - Soil Mapping and Report
Shields, P.G. (1984). <i>Land Suitability Study of the Collinsville - Nebo - Moranbah Region</i> , Department of Primary Industries, Queensland Government.	1:250,000 - Soil Mapping and Report
Aldrick, J.M. (1988). <i>Soils of the Elliot River - Bowen Area, North Queensland, Resource Series</i> . Department of Primary Industries, Queensland Government.	1:100,000 - Soil Mapping and Report
Queensland Government Interactive Resource and Tenure Maps	Various

2.2.2 Aerial Photography and Regional Ecosystem Information

In preparing for soil surveys, stereo pair aerial photo interpretation is typically the preferred method for defining PMU's and polygon boundaries. Observations of distinctive patterns and changes in tone and texture are used to identify soil landscapes with different sets of attributes.

Air photo interpretation has been completed by the Queensland Herbarium in developing Regional Ecosystems (REs) mapping at a scale of 1:100 000 for the majority of Queensland, and at a scale of 1:50 000 for some areas in Southeast Queensland. The RE mapping developed by the Queensland Herbarium has established an internationally recognized methodology for vegetation survey and mapping. Pre-clearing RE mapping vegetation communities were drawn from 1960's aerial photos with the aid of any available land system, geology, soils, other land resource mapping as well as early surveyor records. This air photo interpretation was followed by field sampling, ground truthing and data collection. This information was collated and analysed before different photo patterns were assigned to different ecosystem types.

RE mapping identifies vegetation communities that are consistently associated with a particular combination of geology, landform and soil in a bioregion. Data and polygon line work from Pre-clearing RE mapping was used in developing PMU's that identified required ground observations in the soil study field program.

2.2.3 Geological Information

Three datasets of 1:250,000 scale geology maps from Geological Survey Queensland Digital Geology will be analysed. These include:

Table 2 Geology Map Coverage

Geology Map

Geology of Ayr, *Australia 1:250,000 Geological Series*, Sheet SE 55-15 (1968)

Geology of Bowen, *Australia 1:250,000 Geological Series*, Sheet SF 55-3 (1971)

Geology of Mount Coolon, *Australia 1:250,000 Geological Series*, Sheet SF 55-7 (1997)

In addition to the 1:250,000 geology maps available, 1:100 000 geology maps will also be used during the field investigation and reporting. The following 1:100 000 geology maps have been made available digitally from DERM:

- ▶ Wyena 1:100 000 Geological Map, 2010 (8454)
- ▶ Byerwen 1:100 000 Geological Map, 2004 (8445)

The remaining 1:100 000 geology mapping relevant to the corridor include Collinsville, Bogie, Abott Point, and Strathalbyn maps. These maps are not available digitally and the hard copies will be sourced if possible.

2.2.4 Topographical Feature Information

Remote sensed airborne laser scanning will be captured used to assess the topographical features across the study corridor. Light Detection and Ranging (LIDAR) imagery and point data will be used to identify landscape changes that will aid in the identification and delineation of landforms, drainage lines, and soils. Published topographical mapping, Google imagery and contour data at 10 m intervals from the DERM will be also be referenced as required.

2.2.5 Development of Preliminary Mapping Units

The Preliminary Mapping Units (PMU's) within the Project alignment will be developed to identify tracts of land that share similar attributes; which can be separated from neighboring tracts of land with a different pattern of attribute values. A PMU is an area of a pre-defined class that is not considered to be unique in the sense that the same PMU (soil, geology, vegetation, and landform) may be encountered more than once. The development of PMU's for the alignment will be undertaken based upon a review of existing information by utilizing GIS information to overlay mapping of land systems, soils, vegetation communities, land zones, and geology.

Along the portions of the alignment where 1:100 000 mapping is available, the existing soils polygon data will be reviewed with LIDAR information for the development of PMU's. The main exception to this will be where these polygons are large in size and where pre-clearing RE mapping indicates changes in either vegetation communities or land zones. In these cases the PMU's reconsidered based upon the pre-clearing RE mapping and LIDAR information.

Along the portions of the alignment where 1:100 000 mapping is not available the PMU's will be developed with consideration of land system and land resource mapping, geology, pre-clearing RE

mapping, and LIDAR information. The scale of soil mapping in these areas is understood to be at a scale between 1:500 000 and 1: 1 000 000 therefore it is expected that LIDAR information and geological mapping at 1: 100 000 and pre-clearing RE mapping of 1:100 000 will be of great value to define PMU's.

2.3 Field Program

The soil survey will be undertaken by suitably qualified professionals in soil survey. The minimum qualification requirements for professionals conducting soil surveys include:

- ▶ Certified Practising Soil Scientist (CPSS) Level 2 competency accreditation in soil survey;
- ▶ Minimum of 5 years demonstrated experience in soil surveying; or
- ▶ Persons recognised and agreed upon by the DERM Soil and Land Resource Assessment section prior to commencement of works.

2.3.1 Ground Observation Types and Proportions

During the soil study field work the target will be to ensure that every PMU should receive a ground observation; and every Unique Mapping Area (UMA) that is produced in the resultant mapping, following the field work, should contain at least one detailed site description. A brief description of the ground observation is provided below. A breakdown of the types and approximate proportion of these sites is included Table 3.

Table 3 Different Ground Observation Types for PRX soil survey

Ground Observation Types	Proportion of sites (approximate only)
1. Full morphological description with full analysis <i>Detailed descriptions of one or more representative profile soil types (more for major soils) with full profile laboratory analysis to 1.5 m, rock or trench depth.</i>	~20-50%
2. Full morphological description with diagnostic analysis <i>Detailed profile descriptions to 1.5 m or rock, or to proposed trench or excavation depth for pipelines or channels if depth >1.5 m; adequate subsoil chemical analysis (diagnostic sampling) to identify and classify the soils.</i>	~50-80%
3. Brief morphological observation <i>Less detailed soil descriptions with cores to sufficient depth to identify the soil; minimum description and recording.</i>	~20-30%
4. Brief surface observation <i>Surface features check sites in large uniform areas and to establish soil boundaries. Check sites should have a minimum of data recorded to confirm the mapped soil type, such as location, landform, vegetation, surface characteristics, surface horizon characteristics, relevant notes, and soil type.</i>	~10%

2.3.2 Mapping Scale and Ground Observation Intensity

The mapping scale will be dependent upon the intended potential agricultural land use of different land units with more detailed surveys in areas of higher agricultural value or more intensive use, in particular cropping/horticultural areas (Figure 2 *SCL and Agricultural Classes*; and Figure 3 *Soil Survey Scales for EIS*, Appendix A). The proposed soil survey scales are as follows:

- ▶ Potential SCL land included on the SCL trigger maps will be surveyed as recommended in the draft SCL policy *Protecting Queensland's Strategic Cropping Land – Guidelines for Applying the Proposed Strategic Cropping Land Criteria* (DERM, 2011). The scale of surveys will be dependent on whether the lands occurs in the Coastal Queensland or Western Cropping areas;
- ▶ Good quality agricultural land will be surveyed at a scale of 1:100 000.

The intensity of ground observations is related directly to scale. The intensity for ground observations is included in Table 4.

Table 4 Ground Observation Intensity

Potential Land Use	Mapping Scale	Ground Observations
		Linear
Good Quality Agricultural Land	1:100 000	1 site per 100-400 ha (1-4 km ²)
Strategic Cropping Land	As per <i>Protecting Queensland's Strategic Cropping Land – Guidelines for Applying the Proposed Strategic Cropping Land Criteria</i> (DERM (2011)).	

2.3.3 Data Collection

Data will be collected from ground observation sites and will be referenced to the *Australian Soil Survey and Land Survey Field Handbook* (The National Committee on Soil and Terrain, 2009). At all sites this data will include; but not be limited to:

- ▶ Geo location;
- ▶ Land use management;
- ▶ Landscape attributes (landform, vegetation, land degradation, erosion, scalds; etc.);
- ▶ Micro-relief; and
- ▶ Full morphological description or correlate to existing mapping with sites within the survey.

2.3.4 Full Morphological Descriptions

Full morphological descriptions will include the collection and recording of the following details:

- ▶ Horizon depths;
- ▶ Horizon designation;
- ▶ Boundary distinctness;
- ▶ Field texture;
- ▶ Colour (Munsell colour chart);
- ▶ Mottles;
- ▶ Coarse fragments;
- ▶ Structure;
- ▶ Segregations; and
- ▶ Field tests (e.g. pH).

2.3.5 Laboratory Analysis

Laboratory analysis will be undertaken by a National Association of Testing Authorities (NATA) or Australian Soil and Plant Analysis Council (ASPAC) accredited laboratory. Different analytical suites will be adopted based on site description. The analytical suites for the *full morphological description with full analysis*; and *full morphological description with diagnostic analysis* sites are included below.

Full morphological description with full analysis

- ▶ pH, electrical conductivity, chloride (1:5 soil water ratio);
- ▶ Exchangeable cations, cation exchange capacity, and exchangeable sodium percentage:
 - If pH is equal to or greater than 7.0 the alcoholic cations method for exchangeable cations will be used;
 - If pH is less than <7.0, the aqueous cations method for exchangeable cations, will be used, and the sodium value adjusted for soluble sodium.
- ▶ If pH < 5.5 (i.e. strongly acid soils), exchangeable acidity, exchangeable aluminium and DTPA iron and manganese will be tested;

- ▶ Particle size analysis;
- ▶ Fertility suite (macro and micronutrients) – topsoil only; and
- ▶ Organic carbon, total nitrogen, available P - topsoil only.

Full morphological description with diagnostic analysis

Adequate subsoil chemical analysis (diagnostic sampling) will be undertaken to identify and classify the soils. This will include, but not be limited to:

- ▶ pH, electrical conductivity, chloride (1:5 soil water ratio);
- ▶ Exchangeable cations, cation exchange capacity, and exchangeable sodium percentage:

2.3.6 Sample Collection Protocol

Standard sample depths will be 0-10, 20-30, 50-60, 80-90, 110-120, 140-150, 170-180 cm particularly for uniform or gradational soils. However, these depths will be modified to ensure that significant horizon boundaries are not crossed in the sample e.g. an A2/B1 boundary.

In collecting samples the following practices will be adopted:

- ▶ Samples will not span significant horizon boundaries;
- ▶ Samples will not be bulked between sites;
- ▶ No sample will interval exceeded 30 cm;
- ▶ Samples will be from a detailed profile description site;
- ▶ Samples for chemical analysis will be placed into zip locked bags as approximately 500 grams will be required to adequately analyse samples. In many cases two soil cores will be required obtain sufficient sample for laboratory analysis.

2.3.7 Auger Hole or Undisturbed Cores

Site descriptions will be made from either augured holes, or undisturbed cores.

Generally soil profile descriptions will be to depths of 1.2-1.8 m unless refusal occurs. At hill slope sites soils will be described to bedrock (C or R horizon) where soil depths are <2 m.

2.3.8 Environmental and Cultural Heritage Management

Soil sampling locations and sample methods have been based on minimising surface disturbance and therefore not requiring cultural heritage clearance or any approvals in relation to native vegetation clearing.

2.4 Reporting

A technical soil report(s) will be prepared that includes descriptions of the soil landscape units, figures of the soil distributions, laboratory results, soil classifications, and landscape details, limitations and constraints, and recommendations. Land suitability's of areas will be determined for cropping and grazing, as well as the SCL and Class A, B, C, and D agricultural land and GQAL status of these lands.

2.4.1 Mapping

The mapping exercise will be completed following the field work to develop Unique Mapping Areas (UMAs) which reflects variations in geology, landform, drainage, and vegetation along the alignment¹.

Each delineated UMA is presumed to be unique until an explicit classification proves it to be similar or identical to another tract. A UMA is an area of land where the attribute values are sufficiently uniform or distinct from neighbouring areas to justify its delineation.

- ▶ UMAs will be characterised based on their attributes to determine land suitability.

These will be classified in regard to:

- SCL status;
- Land suitability for cropping and grazing; and
- GQAL status
- ▶ Soil types will be grouped by parent material and position in the landscape with examples including:
 - Shallow, stony loamy soil;
 - Shallow cracking clay;
 - Deep cracking clay;
 - Deep saline and/or sodic cracking clay;
 - Deep saline and/or sodic cracking clay with melon holes;
 - Shallow non-cracking clay;
 - Deep non-cracking clay;
 - Deep saline and/or sodic non-cracking clay;
 - Loamy surface, non-sodic duplex soil;
 - Thin surface, sodic duplex soil;
 - Medium to thick surface (>15 cm), sodic duplex soil; and
 - Massive gradational textured soil.
- ▶ All maps will followed cartographic conventions, and will include the following:
 - Scale for polygonal data, cell size and scale for rasters;
 - North arrow;
 - MGA grid;
 - Appropriate locality data e.g. towns, administrative boundaries;
 - Legend;
 - Due reference to data sources and currency of data;
 - Date of preparation;
 - Statement of any limitations of the data/map e.g. related to scale, accuracy, reliability;

¹ Different soil types could be expected on the crests and upper slopes, middle slopes and lower slopes of different lithology's (basalt, granite, sandstone, mudstone, etc.), as well as in narrow drainage flats, floodplains, relict alluvial plains, and river levees.

- Location of soil profile descriptions and sampling sites must always be provided on a suitable map e.g. soil/landscape map.

2.5 Assumptions and Limitations

- ▶ Sample locations are restricted to land parcels where access was permitted at the time of field work;
- ▶ Background information is based on the accuracy of desktop reports and maps;
- ▶ Topsoil depths will be accurate for sample locations only.

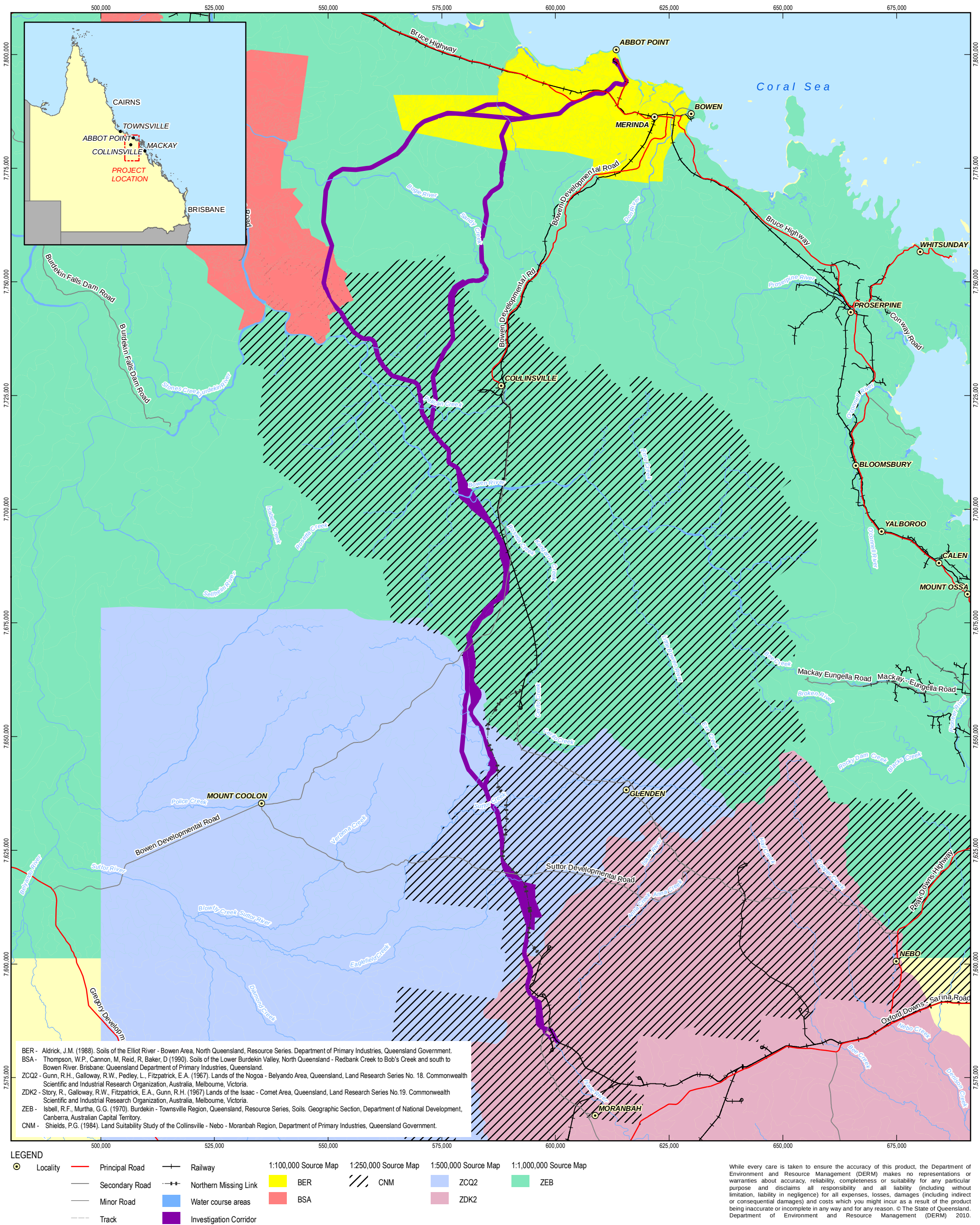
References

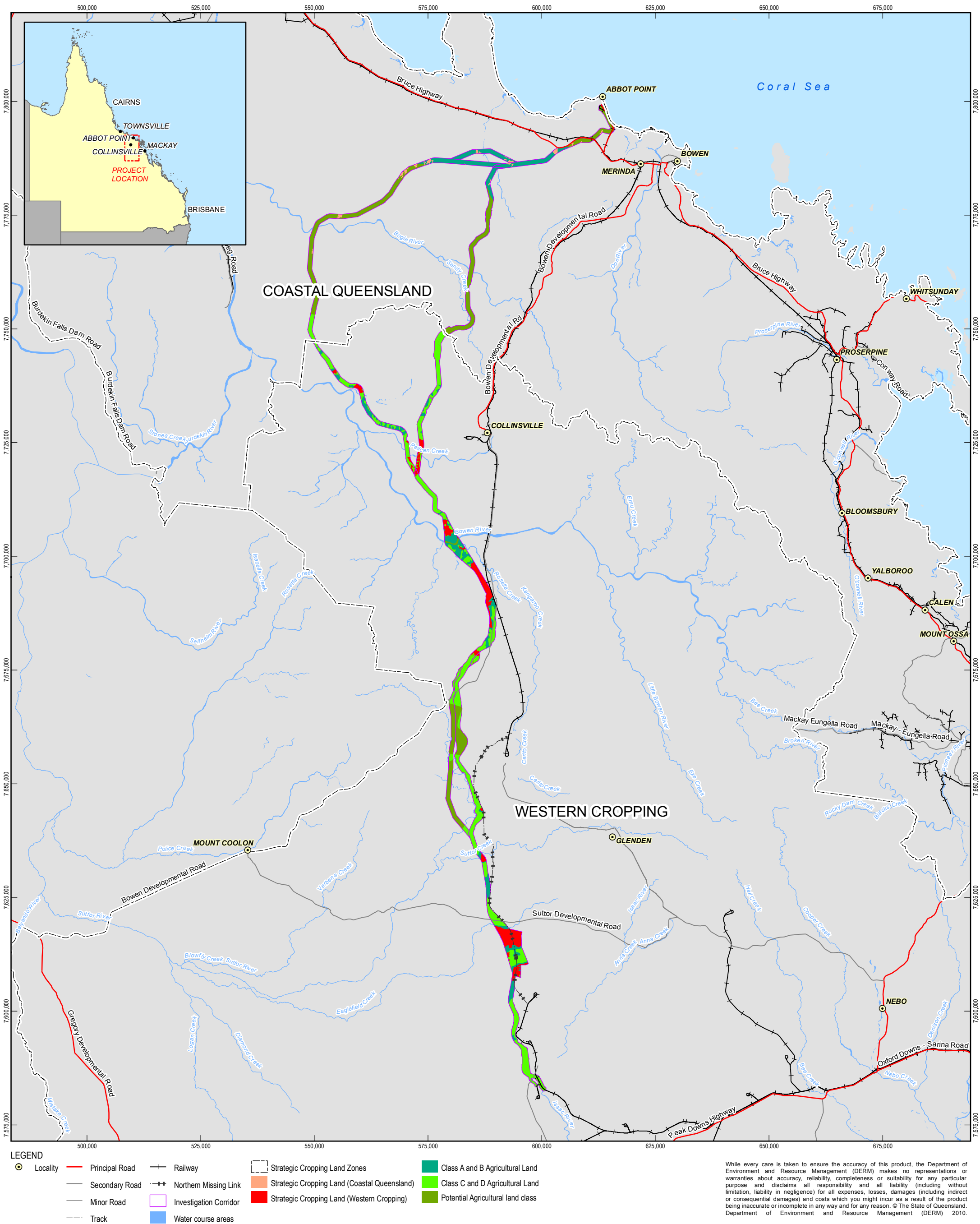
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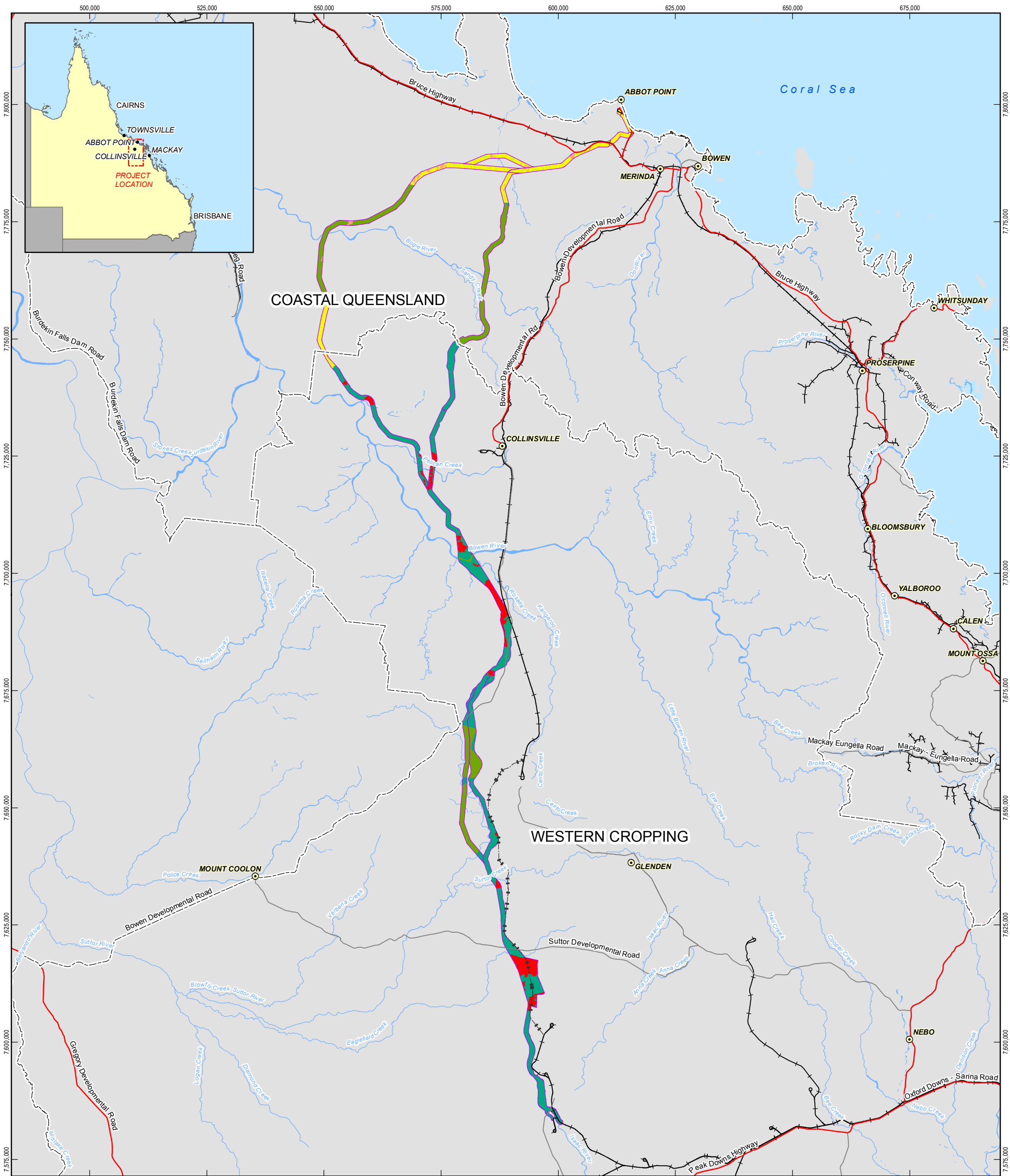
Appendix A

Figures

- Figure 1 Published Soil Mapping**
- Figure 2 SCL and Agricultural Classes**
- Figure 3 Soil Survey Scale for EIS**







LEGEND

● Locality	— Principal Road	— Railway	□ Strategic Cropping Land Zones	■ 1 site per 100 - 400 ha (Good Quality Agricultural Land)
— Secondary Road	— Northern Missing Link	□ Investigation Corridor	■ 1: 25,000 Strategic Cropping Land (Coastal Queensland)	■ 1 site per 100 - 400 ha (Good Quality Agricultural Land assessment)
— Minor Road	— Water course areas	□ No additional survey required (1:100 000 mapping)	■ 1: 50,000 Strategic Cropping Land (Western Cropping Area)	
— Track				

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Geology Methodology Report	Data Source References		
Theme	Datasets	Custodian	Currency (Date)
Locations	Locality/Placenames/Key Locations	GA	2006
Planning	DCDB Cadastre	DERM	2011
Transport	Existing Road	GA/DERM	2010
	Existing Rail	GA/DERM	2007
	Northern Missing Link Rail Alignment	GHD	2010
	Investigation Corridor D	Aurecon Hatch/ BHP Billiton	2011
	Investigation Corridor E	Aurecon Hatch/ BHP Billiton	2011
Protected Area	Nature Refuge	DERM	2011
	Protected Areas of Queensland	DERM	2010
	Reserves	GA	2007
Flora and Fauna	Regional Ecosystems (v6)	DERM	2009
Geology	100K Soils	GA	2007
	500K Soils	GA	2007
	2 M Soils	GA	2007
	Strategic Cropping Land Trigger v 1.0	DERM	2011
	Strategic Cropping Land Zones	DERM	2011
Soils	Good Quality Agricultural Land	DERM	2010
	Acid Sulfate Soils	CSIRO Land & Water	2009
Waterways	Watercourse Areas/Lines	GA	2007
	Reservoirs	GA	2007
	Lakes	GA	2007
	Australia Land Mass	ASGC	2006
	Oceans	GA	2007
Elevation	Hill Shade	ESRI	2009

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 - e. Problematic Soils
 - f. Erosion Potential
- 6. Disturbance Management
 - a. Topsoil Stripping and Management
 - b. Topsoil Respreading
 - c. Erosion Control
 - d. Rehabilitation Issues
- 7. Conclusion and Recommendations
- 8. References

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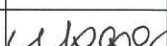
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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
A	S Buchanan	K Woods				11.10.2011
0	D Doolan	K Woods		M Roser		12.12.2011

