Adani Mining Pty Ltd

Carmichael Coal Mine and Rail Project

Environmental Management Plan - Offsite

March 2014

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1. Introduction

1.1 Project Background

The Carmichael Coal Mine and Rail Project was declared a 'significant project' under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and as such, an Environmental Impact Statement (EIS) is required for the Project. The Project is also a 'controlled action' and requires assessment and approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

On 24 May 2011, the Coordinator-General issued the Final Terms of Reference (TOR) for the EIS (State of Queensland, 2011). The TOR set out the general and specific matters the project proponent must address when preparing the EIS. This document addresses Section 8 of the Final TOR relevant to the Project which required Adani to develop an Environmental Management Plan (EMP) for the Project. This EMP has been developed specifically to manage environmental requirements for the Project (Offsite).

The EIS, submitted in December 2012, assessed the environmental, social and economic impacts associated with developing a 60 million tonne (product) per annum (Mtpa) thermal coal mine in the northern Galilee Basin, approximately 160 kilometres (km) north-west of Clermont, Central Queensland, Australia. Coal from the Project will be transported by rail to the existing Goonyella and Newlands rail systems, operated by Aurizon Operations Limited (Aurizon). The coal will be exported via the Port of Hay Point and the Point of Abbot Point over the 60 year (90 years in the EIS) mine life.

Project components are as follows:

- The Project (Mine): a greenfield coal mine over EPC 1690 and the eastern portion of EPC 1080, which includes both open cut and underground mining, on mine infrastructure and associated mine processing facilities (the Mine) and the Mine (offsite) infrastructure including a workers accommodation village and associated facilities, a permanent airport site, an industrial area and water supply infrastructure
- The Project (Rail): a greenfield rail line connecting to mine to the existing Goonyella and Newlands rail systems to provide for the export of coal via the Port of Hay Point (Dudgeon Point expansion) and the Port of Abbot Point, respectively including:
  - Rail (west): a 120 km dual gauge portion running west from the Mine site east to Diamond Creek
  - Rail (east): a 69 km narrow gauge portion running east from Diamond Creek connecting to the Goonyella rail system south of Moranbah
  - Quarries: The use of five local quarries to extract quarry materials for construction and operational purposes

1.2 Environmental Management for the Carmichael Coal Mine and Rail Project

This EMP (Offsite) has been prepared to support an environmental impact assessment process for the Carmichael Coal Project under the EPBC Act and SDPWO Act. As such, the EMP reflects the findings and recommendations of studies undertaken for the EIS, and provides a framework for management of identified impacts and implementation of recommendations made in the EIS. The EMP will be further developed as detailed design of the Project continues and to achieve compliance with conditions of approvals obtained.

Environmental management for the Project (Offsite) will operate within an Environmental Management System (EMS) framework, in accordance with the ISO 14001: 2004 EMS standard.

In relation to site and project specific requirements, this EMS will apply on a site-specific and project-specific basis and is managed by the Environmental function on each site and overseen by the relevant area managers.

For projects and operating sites, the EMS requires:

- The establishment of systems and arrangements to ensure compliance with the Adani EMS Management Standards.
- Utilising Adani EMS Compliance Guidelines for the development and implementation of procedures.
- Contributing to the implementation and on-going operation of the EMS.

In regards to ongoing environmental management, the Carmichael Coal project has been split into three components for the purposes of preparing environmental management plans:

- Mining activities, being all activities carried out within the mining leases. Environmental management of these activities will be covered in the EMP (Mine)
- Off-site infrastructure, including workers accommodation village, dedicated airport, off-site industrial area and associated infrastructure such as water supply, storage and transfer infrastructure. Environmental management of these activities is covered in this EMP.
- Railway activities, associated maintenance facilities and Quarries. Environmental management of these activities will be covered in the EMP (Rail).

Each environmental management plan covers:

- Design and pre-construction requirements
- Construction phase activities
- Operation activities
- Decommissioning.

Closure and Rehabilitation requirements have been identified and included in a separate Closure and Rehabilitation Management Strategy Plans for Offsite Infrastructure.

Depending on the selected contracting strategy for the construction and operation phases, contractors and subcontractors may be required to prepare stand-alone environmental management plans for those aspects of the project under their control. Such plans will be required to be consistent with this EMP.

As required by the continual improvement approach to environmental management, this EMP is a dynamic document and will be updated as required to reflect:

- Changing significance of impacts and hazards associated with the offsite infrastructure construction
- Changes in legal and other obligations
- Learnings and corrective actions from monitoring activities.

Reviews of the EMP and management review requirements are set out in Section 5.1. As the Carmichael Coal Offsite Infrastructure Project (Project (Offsite)) will support the Carmichael Mine which has a proposed operating life of 60 years, it is likely that significant changes in legislation, policy and available techniques in relation to environmental management will occur during the life of the project. Annual review of the EMP will ensure that changes are adopted.

2. Project Description

2.1 Project location

The Project (Mine) is located in the northern part of the Galilee Basin, Central Queensland. The Mine will be developed over EPC1960 (incorporating Mining Lease Application (MLA) 70441) and part of EPC1080, located approximately 160 km north-west of the town of Clermont.

2.2 Offsite Infrastructure

Offsite infrastructure necessary for the Project (Mine) includes that required for the successful construction and operation of the Mine. All Project (Mine) offsite infrastructure will be situated on the Moray Downs cattle station, Lot 662 on PH1491, to the east of the Mine site, including (Figure 2-1):

- Workers accommodation village
- Industrial precinct including rail siding to facilitate services such as fuel farm, freight unloading terminal, etc.
- Permanent airport
- Offsite water supply infrastructure
- Upgrade and realignment of Moray-Carmichael Road.

2.2.1 Workers Accommodation Village

The workers accommodation village will be located approximately 12 km east of the Mine and accessed via the upgraded and realigned Moray-Carmichael Road. The village will have capacity to accommodate up to 3,000 beds for the Project (Mine). All supporting recreational, health and safety requirements for workers will be provided in the village. The permanent airport will be positioned approximately five kilometres west of the workers accommodation village and will provide access for fly-in-fly-out workers. Offsite water supply infrastructure will enable the extraction, storage and delivery of water during the construction and operation phases of the Project (Mine). The infrastructure will extend along the waterways North Creek and Belyando River.

The workers accommodation village will incorporate medical facilities; recreational areas such as outdoor barbecues and shelters; recreational facilities including gymnasium, sport fields; covered walkways and hard and soft landscape treatments; laundry facilities; bus pick up and set down area and parking areas.

2.2.2 Airport

An airport will function for the Project to service fly-in-fly-out operation and general access to other regional and national centres. The siting of the airport considers its function of servicing the mine and rail workers accommodation. The airport will be accessed from the realigned Moray-Carmichael Road and will be positioned approximately five kilometres west of the workers accommodation village. The permanent airport will occupy approximately 365 ha and consist of an airstrip with a maximum length of 3,000 m and a width of 300 m, and a landside terminal of up to 3,000 m^2.

2.2.3 Industrial Area

An industrial area will be established as part of the offsite infrastructure to provide for servicing and maintenance of vehicles and equipment for the Mine. Facilities will include:

- Vehicle and equipment fabrication and maintenance workshops
- Bulk fuel storage
- Vehicle wash areas
- Warehouse and storage
- Office and administration buildings.

The industrial area will be located on a land parcel approximately four kilometres to the east of the EPC1080 lease directly to the north of the Project (Rail). The industrial area is located in this position to allow access to a rail siding for use in supply logistics to the Mine development.

2.2.4 Water Supply

Water supply for the Mine and offsite infrastructure will be achieved using a combination of boreholes, mine dewatering, river flood harvesting and water recycling. Water supply infrastructure will primarily be located offsite; however some water will be made available on site through recycling at the coal handling and preparation plant, mine dewatering and overland flow harvesting.

River flood harvesting is proposed at the Belyando River (Figure 2-1). This will be achieved by installing pumps that will automatically switch on as river levels rise above a pre-determined level, and then switch off again when river levels fall.

The proposed Belyando River pump station will be located on the Moray Anabranch on the western river bank. The pump station will consist of four centrifugal, submersible pumps operating in Duty / Assist / Assist / Standby configuration within a channel excavated to river invert depth, providing a combined flow rate of approximately 200 ML/day. The pumps will be located within a three sided concrete structure, with the control valves located on an adjacent, integral slab. All electrical equipment will be situated at high level, above the 1:100 ARI flood level. The proposed pump station structure footprint is 12 m x 10 m, with the incoming flow channel approximately 10 m wide x 15 m long.

The pump stations will either be powered by local diesel generators or power from the grid. Where power from the grid is required, powerline alignments will follow the pipeline corridors identified for the associated pump station.

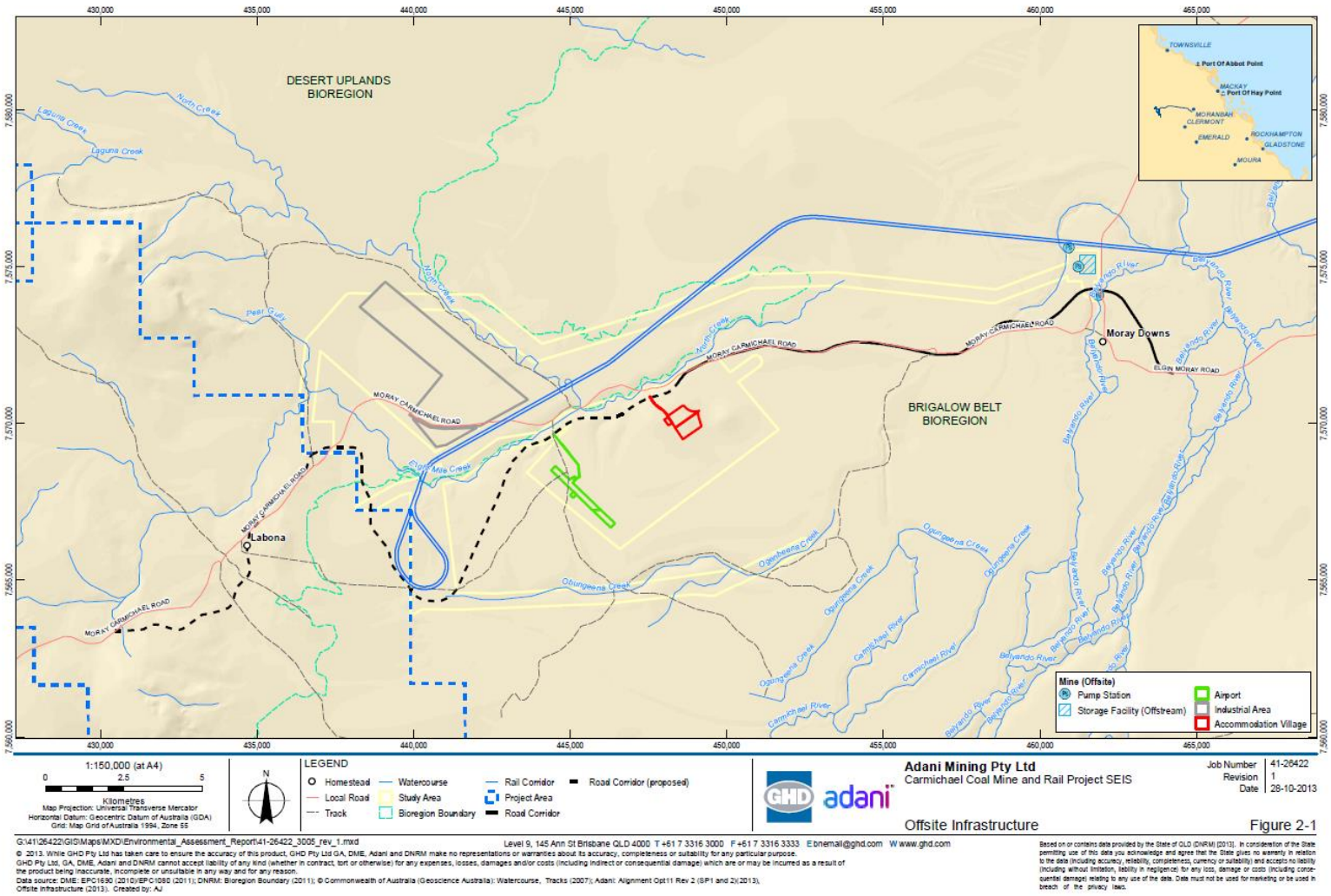
2.2.5 Access Roads

Access roads are to be provided to allow for vehicular access to:

- All pumping station and storage locations
- Air valves, scour valves an isolation valves on all pipelines (locations to be confirmed during detailed design)
- All boreholes
- All electrical infrastructure.

Parking and loading areas, suitably sized for appropriate vehicles, will be provided to allow for maintenance and removal of mechanical and electrical equipment.

Figure 2-1 Offsite Infrastructure



Data source: DME: EPC1690 (2010)EPC1060 (2011); DNRM: Bioregion Boundary (2011); © Commonwealth of Australia (Geoscience Australia): Watercourse, Tracks (2007); Adani: Alignment Opt11 Rev 2 (SP1 and 2)(2013), Offsite Infrastructure (2013). Created by: AJ

3. Environmental Management Framework

3.1 Environment and Sustainability Policy

Adani is committed to the protection of the environment and to the sustainable management of its operations and activities. Adani operates an established Health, Safety and Security (HSS) Management System and will develop and implement an Environmental Management System (EMS) to support the construction and operation of the Project. These systems will be developed to comply with relevant legislative standards for operation of railway operations within Queensland, and comprise an Environment and Sustainability Policy and EMS Management Standards. A copy of Adani's Environment and Sustainability Policy is attached in Volume 4 Appendix A of the EIS.

The EMS will guide environmental management for the Project (Offsite) by providing a framework to prevent or minimise environmental harm, ensure compliance and promote continuous improvement. Key components of the system will include:

- Responsibility, authority and commitment
- Planning, objectives and legal obligations
- Training and competence
- Documentation, document control and records
- Incidents and performance measurement
- Communication, consultation and involvement
- Emergency preparedness and response
- Reviews, audits and inspections.

All contractors and staff involved in the Project (Offsite) will be required to adhere to Adani's Environment and Sustainability Policy and the key requirements of the EMS.

3.2 Planning for Environmental Management

Environmental management requires a continuous process of:

- Identification of impacts and risks to the environment from the mining activity and setting targets for environmental performance and protection of environmental values
- Developing and implementing controls and management actions to achieve targets
- Monitoring and reporting on the effectiveness of controls and management actions in protecting environmental values and meeting objectives
- Reviewing and updating systems, processes and corrective actions through a focus on continual improvement.

This cycle, known as the plan-do-check-review cycle is shown in Figure 3-1.

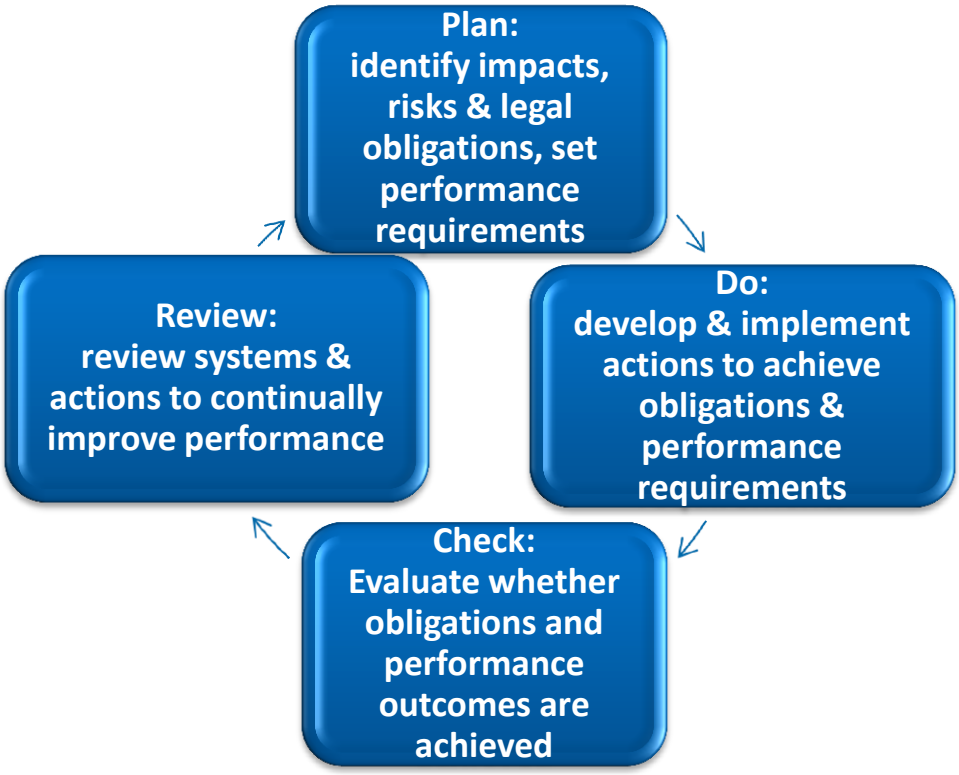


Figure 3-1 Plan-Do-Check-Review Cycle

Sub plans (in Section B) developed for this EMP reflects this process by presenting:

- Legislative framework relevant to the particular element
- Information on key environmental values and sensitivities potentially impacted by the offsite infrastructure operations
- A summary of impacts potentially arising from construction and operation
- Preliminary performance outcomes in relation to management of impacts on the environmental values
- Management controls for the design, construction and operation phases of the Carmichael Mine and associated offsite infrastructure
- A program of monitoring against performance indicators and suggested corrective actions in the event that monitoring indicates that performance requirements have not been met.

These sub plans sit within an overall framework of continuous review and improvement of environmental performance.

This EMP reflects the general requirements of an EMS. Mapping of contents against ISO14001 requirements is provided in Table 3-1.

Table 3-1 Mapping Against EMS Requirements

ISO 14001 Requirement	How addressed
PLANNING	
Environmental policy	Section 3.1 contains Adani's Environment and Sustainability Policy.
Roles and responsibilities	Section 3.3 identifies roles and responsibilities during design, construction and operation.
Environmental aspects and impacts	Section B: Sub Plans Environmental values and potential impacts of construction and operation of the Carmichael Coal Offsite Infrastructure Project are set out in the sub-plans for each element.
Legal and other obligations	Overarching legal and other obligations are in Section 3.4. Sub-plans for each element also include legislation relevant to these elements. Conditions of approval not yet issued will be incorporated into the legal and other obligations register upon receipt.
Objectives and targets	Performance outcomes are also identified in sub-plans for each element. Monitoring requirements also include performance indicators for each monitoring requirement.
IMPLEMENTATION	
Operational control and procedures	Operational controls are set out in the individual sub-plans for each element in Section B: Sub Plans.
Training and competency	Training and competency requirements are included in Section 3.7.
Documentation and records	Documentation and record keeping is addressed in Section 3.8. Management controls in each sub-plan also specify evidence requirements in relation to implementation of each control.
CHECKING	
Checks and inspections	Requirements for checks and inspections are set out in Section 4.2.
Monitoring	Section 4.1 identifies a summary of monitoring requirements. In addition, monitoring requirements are set out in the sub-plans for each element.
Auditing	Auditing requirements are provided in Section 4.3.
ACTING	
Corrective actions	Corrective action requirements are set out in Section 3.6.
Management review	Management review requirements are set out in Section 5.1.

3.3 Roles and Responsibilities

3.3.1 Overview

Adani's Compliance Guidelines set out requirements for assigning roles and responsibilities in relation to environmental management.

Preliminary roles and responsibilities for design and pre-construction, construction and operation phases are presented in Sections 3.3. These will be revised once organisational structures for each phase of the project are confirmed.

In accordance with the guideline:

- Position descriptions will contain responsibilities and accountabilities for environmental compliance and management
- Performance against environmental compliance and management requirements will be part of the annual performance review and linked to remuneration and promotion of managers.

3.3.2 Design and Pre-Construction

Table 3-2 Roles and Responsibilities – Design and Pre-construction

Role	Responsibility
CEO	Approve and endorse the Environment and Sustainability Policy. Ensure that adequate resources are available to comply with the Environment and Sustainability Policy.
Adani Senior Management	Ensure compliance with all legal requirements including requirements of EPBC approval, environmental authority and other environmental and planning approvals. Ensure that requirements of this EMP are incorporated into engineering and procurement processes, and that these processes do not conflict with environmental performance requirements. Ensure that adequate resources are available to meet all compliance requirements and implement the requirements of this EMP. Demonstrate a visible and pro-active commitment to environmental issues as per Adani Guideline CG-128 – Management Commitment.
Adani Contract Management and Procurement Team	Ensure that procurement and contracting strategies reflect environmental performance requirements and requirements of Adani Guidelines CG-022 – Contractor's Management and CG-021 – Procurement. Ensure that specifications and contracts include performance requirements in relation to energy and water efficiency and other measures to reduce resource consumption and waste generation. Incorporate environmental performance requirements into

Role	Responsibility
	contracts. Ensure that contractors hold necessary approvals and authorisations, particularly in relation to waste management services. Review environmental performance credentials of potential contractors. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment.
Design Manager	Ensure that design requirements set out in this EMP and any other design requirements needed to meet conditions of approval are incorporated into design. Consider safety in design and minimisation of environmental impacts in design. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment.
Design Leads	Develop design checklists to reflect design requirements set out in this EMP and maintain records of compliance with design requirements.
Environmental Manager and Advisors	Provide advice to management, procurement and design teams in relation to environmental requirements. Conduct regular audits and checks of environmental performance. Manage technical studies and research activities relating to environmental assessment and management of the Project. Maintain and further develop the EMP.
Stakeholder Manager	Manage external relations with landholders and other stakeholders. Coordinate investigation and response to complaints and incidents involving members of the public.

3.3.3 Construction

Table 3-3 Roles and Responsibilities – Construction

Role	Responsibility
CEO	Approve and endorse Environment and Sustainability Policy. Ensure that adequate resources are available to comply with the Environment and Sustainability Policy. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment.

Role	Responsibility
Adani Senior Management	Ensure compliance with all legal requirements including requirements of EPBC approval, environmental authority and other environment and planning approvals. Ensure that adequate resources are available within Adani and contractors to meet all compliance requirements and implement the requirements of this EMP. Monitor close-out of corrective actions. Review outcomes of incident investigations. Demonstrate a visible and pro-active commitment to environmental issues as per Adani Guideline CG-128 – Management Commitment.
Adani Contract Management Team	Manage environmental performance requirements in contracts, including penalties in the event of non-compliance. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment.
Adani Environmental Manager and Team	Provide advice to Adani management teams and personnel in relation to environmental requirements. Integrate environmental management requirements into work procedures and practices. Conduct audits and checks of compliance and environmental performance of contractors. Monitor and report on compliance against all project approvals and commitments. Communicate environmental obligations and requirements to construction staff. Track changes in legislation, policy and other obligations and ensure these are incorporated into environmental compliance and management requirements and communicated to relevant managers and staff. Manage technical studies and research activities relating to environmental assessment and management of the Project. Raise corrective actions for any non-compliance with this EMP, approval conditions or in response to results of incident investigations. Conduct incident investigations, report to Adani on environmental performance including compliance, non-compliance, incidents and near misses with potential or actual environmental harm. Further develop the EMP.

Role	Responsibility
Construction Managers and Supervisors	Implement all relevant requirements of this EMP. Integrate environmental management requirements into work procedures and practices. Provide initial responses to emergencies involving potential environmental impacts. Participate in incident investigations.
Construction Workers and all other Staff	Comply with all relevant requirements of this EMP.
Contractor Environmental Managers and Officers	Assist and support managers, supervisors and workers in implementing the EMP and achieving environmental compliance. Conduct monitoring, auditing and reporting activities required in this EMP. Assist with incident response and investigation where required to manage and address environmental impacts of incidents. Conduct induction training and tool box talks on environmental topics. Compile monthly and quarterly environmental reports.
Stakeholder Manager	Manage external relations with landholders and other stakeholders. Coordinate investigation and response to complaints and incidents involving members of the public.

3.3.4 Operation

Table 3-4 Roles and Responsibilities – Operation

Role	Responsibility
CEO	Approve and endorse Environment and Sustainability Policy. Ensure that adequate resources are available to comply with the Environment and Sustainability Policy. Assign authorities and responsibilities for environmental compliance and performance. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment.

Role	Responsibility
Mine General Manager	Implement the Adani Environment and Sustainability Policy. Ensure compliance with all legal requirements including requirements of EPBC approval, environmental authority and other environment and planning approvals. Monitor actioning and close out of non-conformances. Ensure that adequate resources are available within Adani and contractors to meet all compliance requirements and implement the requirements of this EMP. Ensure that all personnel and contractors understand environmental authority conditions, responsibilities and requirements. Incorporate environmental performance and compliance requirements into job descriptions and performance reviews. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment. Reward outstanding performance in relation to environmental performance.
Area managers (accommodation village, airport, industrial area)	Ensure that requirements of this EMP are incorporated into all aspects of the offsite infrastructure operation and maintenance and are implemented. Raise corrective actions for any non-compliance with this EMP or in response to results of incident investigations. Conduct incident investigations. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment.
Procurement Manager	Ensure that specifications include performance requirements in relation to energy and water efficiency and other measures to reduce resource consumption and waste generation. Ensure that contractors hold necessary approvals and authorisations, particularly in relation to waste management services. Review environmental performance credentials of potential contractors. Demonstrate a visible and pro-active commitment to HSS issues as per Adani Guideline CG-128 – Management Commitment. Meet requirements of Adani Guideline GG-021 – Procurement in relation to purchasing.

Role	Responsibility
Supervisors	Integrate environmental management requirements with work procedures and practices. Raise corrective actions for any non-compliance with this EMP or in response to results of incident investigations. Coordinate initial response to incidents with potential or actual environmental harm.
Employees and contractors	Comply with all requirements of this EMP.
Adani Environmental Manager and Team	Provide advice to Adani managers and personnel in relation to environmental requirements. Assist and support managers, supervisors and workers in implementing the EMP and achieving environmental compliance. Conduct monitoring, auditing and reporting activities required in this EMP. Monitor and report on compliance against all project approvals and commitments. Communicate environmental obligations and requirements to construction and operational staff. Lead and assist with incident response and investigation where required to address environmental impacts of incidents. Conduct induction training and toolbox talks on environmental topics. Compile monthly and quarterly environmental reports. Conduct audits and checks of compliance and environmental performance of contractors. Track changes in legislation, policy and other obligations and ensure these are incorporated into environmental compliance and management requirements and communicated to relevant managers and staff. Manage technical studies and research activities relating to environmental assessment and management of the Project. Review, update and further develop the EMP.
Stakeholder Manager	Manage external relations with landholders and other stakeholders. Coordinate investigation and response to complaints and incidents involving members of the public.

3.4 Legal and other Obligations

3.4.1 Overview

Adani Compliance Guideline CG-002 – Legal Obligations sets out system requirements in relation to legal and other obligations.

These obligations have been detailed through the Carmichael Coal EIS (Volume 4 Appendix D) and SEIS (Volume 4 Appendix C).

Evaluation of compliance with legal and other obligations will be undertaken through regular compliance audits and a quarterly review of changes in legal and other obligations will be undertaken.

Relevant legislation has been identified in sub plans in this EMP.

3.4.2 Applicable Legislation and Policies

Applicable legislation, policies and other statutory instruments are shown in Table 3-5.

Current versions of federal legislation can be obtained from http://www.austlii.edu.au/au/legis/cth/consol_act/.

Current versions of Queensland legislation can be obtained from http://www.legislation.qld.gov.au/acts_sls/acts_sl.htm.

Table 3-5 Summary of Relevant Environmental Legislation – Offsite Infrastructure Activities

Title	Relevance to the Offsite Infrastructure Activity
Commonwealth Legislation	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act implements Australia's obligations to protect and conserve biodiversity and heritage under a range of international treaties and agreements. In relation to projects, the Act requires assessment and approval of actions that may have a significant impact on a range of Matters of National Environmental Significance (MNES), including (as relevant to the Carmichael Coal Project) threatened species and ecological communities, migratory species, World Heritage areas and national heritage places. The Carmichael Coal Project has been declared a controlled action on 6 January 2011 due to the likely potential impacts on MNES (EPBC Referral 2010/5736). Assessment is to be under a bilateral agreement in place with the Queensland government. Activities associated with the Project may not commence until approval is granted under the EPBC Act. Once approval is granted, this EMP will need to be updated to incorporate actions required to achieve compliance with approval conditions.
Native Title Act 1993 (NT Act)	The Commonwealth NT Act objectives are to: • Provide for recognition and protection of Native Title • Establish ways in which future dealings affecting Native Title may proceed and to set standards for those

Title	Relevance to the Offsite Infrastructure Activity
	dealings. • Establish a mechanism for determining claims to Native Title • Provide for, or permit, the validation of past acts, and the intermediate period act, invalidated because of the existence of Native Title. Adani is progressing negotiations with the Wangan and Jagalingou People (registered claims (QUD85/04, QC04/6). It is expected that this agreement will contain actions for Adani in relation to Native Title.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	The *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* preserves and protects nominated areas and objects in Australia and in Australian waters which are of particular significance to Aboriginals in accordance with Aboriginal tradition. There are no such areas of objects within or adjacent to the proposed mine, and hence, requirements of this Act are not relevant to the mining activity.
National Greenhouse and Energy Reporting Act 2007 (NGER Act)	The NGER Act sets up a range of reporting mechanisms to assist the Australian Government in understanding greenhouse gas emissions and energy consumption by corporations. This information is used to monitor emissions profiles, inform government policy, programs and other initiatives and meet National and international reporting obligations. Adani will be required to report under the NGER Act.
National Environment Protection Council Act 1994 (NEPC Act)	The NEPC Act establishes the National Environment Protection Council (now known as the Environment Protection and Heritage Council). The Council is responsible for developing national environment protection measures (NEPM). The National Environment Protection (National Pollutant Inventory) Measure 1998 requires organisations to report on emissions of certain pollutants.
Clean Energy Act 2011 (CE Act)	The *Clean Energy Act 2011* establishes a mechanism for carbon pricing and trading. Adani will be required to trade carbon on the basis of coal production.
Energy Efficiency Opportunities Act 2006 (EEO Act)	The *Energy Efficiency Opportunities Act* (EEO Act) applies to businesses that use more than 0.5 PJ of energy per year. Participants in the program are required to assess their energy use and report publicly on the results of the assessment and the business response. Decisions on energy efficiency opportunities remain at the discretion of the business.

Title	Relevance to the Offsite Infrastructure Activity
Queensland Legislation	
State Development and Public Works Organisation Act 1971 (SDPWO Act)	The SDPWO Act provides for State planning and development through a coordinated system of public works organisation and also provides for coordinated environmental assessment that benefits the State. The SDPWO Act is administered by the Coordinator-General, who is appointed under that Act. The Project was declared a 'significant project' under the SDPWO Act. In December 2012, the *Economic Development Act 2012* amended the SDPWO Act, including changing the name for project subject to the environmental impact statement process. Projects declared as 'significant projects' were renamed as 'coordinated projects'. The Project is now a 'coordinated project' due to the amendments and an EIS was prepared to meet the environmental coordination requirements for projects. The Coordinator-General will draft a report evaluating the EIS and SEIS that includes draft conditions. This EMP will be updated in accordance with the Coordinator-General's report.
Environmental Protection Act 1994 (EP Act)	The EP Act places emphasis on managing Queensland's environment within the principles of ecologically sustainable development. While concerned with all aspects of ecologically sustainable development, regulations, policies and other requirements under the EP Act focus on protection of air quality, acoustic quality and water quality as well as on waste management and land contamination. The EP Act sets up a process for environmental approval of environmentally relevant activities as part of the development assessment process established under the *Sustainable Planning Act 2009*. Construction of components involving environmentally relevant activities cannot commence until a development approval (material change of use) is in place and must then comply with the conditions of the development approval. The EP Act also imposes a 'General Environmental Duty' requiring all individuals and organisations to take all reasonable and practical measures to avoid environmental harm.
Environmental Protection Regulation 2008 (EP Regulation)	Schedule 2 of the EP Regulation lists 57 Environmentally Relevant Activities (ERAs) including waste disposal, water treatment plant and sewage treatment. The regulations also provide a regulatory regime for minor issues involving environmental nuisance such as noise.

Title	Relevance to the Offsite Infrastructure Activity
Environmental Protection (Waste Management) Regulation 2000	The *Environmental Protection (Waste Management) Regulation 2000* implements various waste management matters covered by the EP Act. Relevant to the Carmichael Project, this regulation sets up a system for tracking of certain wastes that are hazardous to the environment. The system tracks wastes from the point of generation to the point of disposal through a docket system.
Environmental Protection (Water) Policy 2009 (EPP Water)	The EPP Water establishes environmental values in relation to Queensland's water resources. The EPP Water also sets up frameworks for water quality guidelines and prescribes specific water quality objectives for a number of basins in Queensland, which are included in Schedule 1 of the EPP Water. Specific water quality objectives have not yet been prescribed for the Burdekin Basin, and hence, water quality objectives default to the objectives required to protect the environmental values of waters.
Environmental Protection (Noise) Policy 2008 (EPP Noise)	The EPP Noise sets acoustic quality objectives and deals with the evaluation procedure. Additionally the policy deals with abatement of unreasonable noise and is intended to provide measures for nuisance noise control.
Environmental Protection (Air) Policy 2008 (EPP Air)	The purpose of the EPP Air is to identify environmental values to be protected or enhanced, specifically air quality indicators, and provides a framework for decision-making. The project will be subject to obligations under the EPP Air.
Mineral Resources Act 1989 (MR Act)	The MR Act covers prospecting, exploration and mining of minerals in Queensland. It does not apply to offsite infrastructure as this will not be located within a mining lease or other mining tenure held by Adani.
Waste Reduction and Recycling Act 2011 (WRR Act)	The WRR Act establishes a framework for waste management and resource recovery practices in Queensland. The purpose of the new legislation is to promote waste avoidance and reduction and to encourage resource recovery and efficiency. The WRR Act does not impose any particular obligations on Adani in relation to the Project (Offsite), but does establish frameworks for introduction of a range of waste management strategies and initiatives such as waste levies, product stewardship programs and other resource recovery programs. These may have implications in relation to waste management services required by the Project (Offsite).
Sustainable Planning Act 2009 (SP Act)	The SP Act provides a framework for development assessment and approval in Queensland, bringing together requirements of a range of legislation.

Title	Relevance to the Offsite Infrastructure Activity
Water Act 2000 (Water Act)	The Water Act provides for management and sustainable use of freshwater resources in Queensland, including surface waters and groundwater. The approach to sustainable management of water resources is through the development of a Water Resource Plan (WRP) and Resource Operations Plan (ROP) for each basin. The WRP and ROP set out the rules for allocation and use of water resources. The Carmichael Project is within the area covered by the *Water Resource (Burdekin Basin) Plan 2007*. Under the Water Act, a licence is required for taking or interfering with water, diversion of waterways and interfering with flow by impoundment of a waterway and will therefore be required for the water supply scheme.
Water Resource (Burdekin Basin) Plan 2007.	Water resource plans set out the requirements for sustainable management of water resources, when water may be taken with and without an allocation and matters to be considered when granting allocations.
Water Supply (Safety and Reliability) Act 2008	Among other things, this Act regulates dams that are not hazardous waste dams. Constructing or raising a dam is assessable development under the SP Act if failure of the dam would put more than two people at risk. The Act sets out requirements for failure impact assessment and other dam safety related requirements.
Fisheries Act 1994 (Fisheries Act)	This Act regulates activities such as fishing, development in fish habitat areas, and damage to and destruction of marine plants in Queensland. Constructing or raising a waterway barrier is assessable development under the SP Act and Fish Habitat Management Operational Policy FHMOP 008 (Waterway barrier works development approvals) is established under the Fisheries Act to guide application for waterway barrier works approval.
Aboriginal Cultural Heritage Act 2003 (ACH Act)	The ACH Act establishes a 'cultural heritage duty of care', which requires that a person who carries out an activity must take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage. In order to discharge this duty of care, Adani has entered into cultural heritage management agreements with the Wangan and Jagalingou People registered native title claim (QUD85/04, QC04/6).
Queensland Heritage Act 1992 (QH Act)	The QH Act provides for the conservation and protection of places and items of historical and/or non-Indigenous cultural heritage. There are no places protected under this Act within the Project offsite infrastructure area.

Title	Relevance to the Offsite Infrastructure Activity
Nature Conservation Act 1992 (NC Act) *Nature Conservation (Protected Plants) Conservation Plan 2000* *Nature Conservation (Wildlife Management) Regulation 2006*	The objective of the NC Act is to conserve nature which is to be achieved by an integrated and comprehensive conservation strategy for the whole of Queensland, involving amongst other things the protection of native wildlife and its habitat. A permit under the NC Act will be required for clearing of all native plants. A permit will also be required if a confirmed breeding place for a native animal is to be disturbed. The *Nature Conservation (Protected Plants) Conservation Plan 2000* sets out certain requirements in relation to permits to clear native plants. The *Nature Conservation (Wildlife Management) Regulation* sets out requirements in relation to permits for tampering with breeding places A permit is also required for fauna spotter-catchers involved in vegetation clearing activities to authorise taking of native animals that may require relocation.
Vegetation Management Act 1999 (VM Act)	The VM Act sets up a process for classifying remnant vegetation and for protecting and conserving remnant vegetation and associated ecological and biodiversity values. Clearing of vegetation specified under the VM Act is assessable development under the SP Act and a development approval is required.
Land Protection (Pest and Stock Route Management) Act 2002 (LP Act)	The purpose of the LP Act is to provide for pest management and for land and stock route network management. Under the LP Act landholders are required to manage certain declared weeds. Weed management is covered in Section 12.
Land Act 1994	The *Land Act 1994* regulates non-freehold land, and also provides a mechanism for conversion of leasehold land into freehold land. The location of the offsite infrastructure is leasehold land (Moray Downs) but Adani will seek to convert this portion to freehold land. While the land remains leasehold, conditions of the lease must be adhered to.
Strategic Cropping Land Act 2011 (SCL Act)	The SCL Act protects areas identified as strategic cropping land, being areas of high quality agricultural land. There are no such areas within the Project offsite infrastructure area.
Queensland Clean Energy Act 2008 (QCE Act)	This Act applies to business using more than 30 TJ of energy, but less than 500TJ and requires reporting of emissions.
Public Health Act 2005	This purpose of this Act is to protect and promote the health of the Queensland public.

3.4.1 Licences, Permits and Approvals

Adani is currently seeking approval for the Carmichael Coal Mine and Rail Project under the EPBC Act and SDPWO Act. This EMP has been prepared in support of these approval applications.

If these key approvals are issued, then Adani will be required to obtain a range of additional environmental approvals and permits as set out in Table 3-6. As permits and approvals are issued, Table 3-6 and relevant sub-plans in this EMP will be updated to reflect conditions.

Table 3-6 Project Approvals – Offsite Infrastructure

Legislation	Approval or Permit	Trigger
EPBC Act	Approval to undertake a controlled action	Potentially significant impacts on MNES.
SDPWO Act	Coordinator-General's report	Declaration of the Carmichael Coal Mine and Rail Project as a Significant Project for which an EIS is required.
SDPWO Act	Development Approval	Development within a State Development Area.
SP Act	Material change of use	Conduct of an environmentally relevant activity (including construction of the facilities required for the environmentally relevant activity).
SP Act	Operational works to clear native vegetation	Clearing of any endangered, of concern or least concern regional ecosystems.
SP Act	Operational works to construct or raise a waterway barrier	Any works in-stream that might temporarily or permanently interfere with fish passage.
SP Act	Operational works to construct or alter a dam	Construction or alteration of a dam that triggers a failure impact assessment. The 5 GL offstream storage may trigger this approval subject to failure impact assessment.
SP Act	Operational works to take or interfere with water	Taking or interfering with water of the operation is mentioned as assessment development under a regulation or water resource plan.
SP Act	Reconfiguration of a lot	If it is required to reconfigure a lot, for example to allow certain land to be made freehold.
EP Act	Registration certificate	Operator of a mining activity or an environmentally relevant activity.
NC Act	Permit to take protected plants	Clearing of native vegetation.

Legislation	Approval or Permit	Trigger
NC Act	Permit to take protected animals	Handling of native fauna encountered prior to or during vegetation clearing.
NC Act	Permit to tamper with a breeding place	Required if any confirmed animal breeding places are disturbed by the offsite infrastructure activity.
Water Act	Licence to interfere with flow by impounding water	Required if impoundment of any watercourse, lake or spring is to occur.
Water Act	Licence to interfere with the course of flow	Required for watercourse diversions.

Environmentally relevant activities proposed at the offsite infrastructure area are shown in Table 3-7 Environmentally Relevant Activities

Table 3-7 Environmentally Relevant Activities

ERA no.	ERA description (Refer to Schedule 2– *Environmental Protection Regulation 2008*)
8 .1(a)	Chemical Storage – storing a total of 50 t or more of chemicals of dangerous goods class 1 or class 2, division 2.3.
8.1(c)	Chemical Storage – more than 500 m^3 of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3
56(1)	Regulated waste storage Operating a facility for receiving and storing regulated waste for more than 24 hours.
63(1)(c)	Sewage Treatment Operating 1 or more sewage treatment works at a site that have a total daily peak design capacity of at least 21EP.

3.5 Performance Outcomes and Indicators

Performance outcomes and indicators are identified in each of the environmental management sub-plans within this EMP under Section B Environmental Management Sub-plans.

These objectives and targets have been developed in accordance with Adani Management Standard ST-02 – Planning, Objectives and Legal Obligations. They aim to be:

- Specific to the project
- Quantified and measurable
- Realistic and achievable
- Focused on continual improvement
- Consistent with, and related to, Adani's Environment and Sustainability Policy and the Adani Management Standards
- Periodically reviewed and, if required, revised
- Performance indicators will be reviewed annually as part of the EMP annual review.

3.6 Corrective Actions

Adani Compliance Guideline CG-005 – Corrective and Preventative Action requires that Adani implements a corrective action process consisting of the following steps:

- Identification of a problem (failure or deficiency)
- Root cause analysis to identify causes and determine solutions
- Decision as to the appropriate action
- Application and documentation of corrective or preventative action
- Follow-up and evaluation.

Corrective actions in relation to environmental management may arise from:

- Recommendations and outcomes of incident investigation reports, including investigations into incidents, near misses and non-compliances
- Reviews of monitoring results indicating that performance requirements are not being met and/or that trends indicate that environmental degradation may be occurring
- Checks and inspections (note that minor corrective actions identified through checks and inspections will generally be resolved on the spot)
- Identification of hazards or improvement opportunities (see also Compliance Guideline CG-009 – Hazard Notification and HSE improvement)
- Audit recommendations (see Section 4.3)
- Complaints.

Corrective actions will be raised through Adani's notification system or through a separate corrective action register if required for contractors not operating under Adani's systems. Completion and close out of corrective actions will be reported at Offsite Infrastructure/ Mine management meetings.

3.7 Training, Competency and Awareness

3.7.1 Overview

System requirements in relation to training and competency are set out in Adani's Compliance Guideline CG-003 –HSS Training. In accordance with the compliance guideline, a training needs assessment will be undertaken once organisational structures are confirmed for each of the construction and operation phases of the offsite infrastructure. Interim requirements are set out in this Section.

Trainers will hold appropriate accreditations or be otherwise appropriately qualified and experienced in the training topic to deliver the training. The provision of training will be in accordance with the Adani's Management Standard ST-03 – Training and Competence.

3.7.2 Environmental Induction and Awareness Training

All employees and contractors other than short term visitors will receive environmental induction training on commencement, and then annual environmental awareness training, covering:

- An overview of environmental values of the site
- Key environmental impacts and risks associated with construction/operation

- Legislative and other responsibilities, including the general environmental duty
- How to conduct task-based environmental risk assessment
- Work permit requirements in relation to any non-routine works
- Waste management and minimisation, including segregation and storage of wastes
- Erosion and sediment control and protection of watercourses
- Fauna interactions
- Weed hygiene requirements
- Aboriginal cultural heritage awareness
- Storage and handling of environmentally hazardous materials
- Spill prevention and response
- Fire prevention and response
- Energy and water conservation
- Incident notification and reporting requirements.

A visitor induction will be given to visitors and short term contractors not engaging in ground-disturbing activities covering:

- General compliance obligations
- Key environmental risks and impacts
- Management and minimisation of waste
- Work permit requirements
- Incident reporting and response.

3.7.3 Construction Training Matrix

A preliminary training matrix has been developed for construction activities and is shown in Table 3-8.

Table 3-8 Preliminary Construction Training and Competency Matrix

Training	CEO	Adani Senior Project Management	Adani Contract Management Team	Adani Environmental Manager and Team	Construction Managers and Supervisors	Construction Workers and all other Staff	Contractor Environmental Managers and Officers	Visitors
General induction	M	M	M	M	M	M	M	
Short induction								M
Adani EMS	M	M	M	M	M		M	
Legal and other obligations	M	M		M	M		M	
Degree qualification – environmental management				M			M	
Dangerous goods storage and handling				M	M	AR	M	
Waste management and minimisation			M	M	M	AR	M	
Spill prevention and response				M	M	M	M	
Fire fighting				AR	AR	AR	AR	
Vegetation clearing and in-stream work procedures				M	M	M	M	
Erosion and sediment control				M	M	M	M	

Training	CEO	Adani Senior Project Management	Adani Contract Management Team	Adani Environmental Manager and Team	Construction Managers and Supervisors	Construction Workers and all other Staff	Contractor Environmental Managers and Officers	Visitors
Energy and water conservation, including vehicle operation to minimise energy consumption			M	M	M	AR	M	
Cultural heritage awareness and monitoring		M		M	M	M	M	
Weed hygiene		M		M	M	M	M	
Work permit requirements		M		M	M	M	M	
Introductory training – new or substantially amended procedures		AR	AR	AR	AR	AR	M	
Tool box talks – environmental topics including minor changes to compliance and management requirements and procedures	AR	M	M	M	M	M	M	AR

M = mandatory
AR = As relevant to work requirements

3.7.1 Operations Training and Competency Matrix

Table 3-9 Operations Training and Competency Matrix

Training	CEO	General Manager	Area Managers	Procurement Manager	Supervisors	Employees and Contractors	Environmental Managers and Officers	Visitors
General induction	M	M	M	M	M	M	M	
Annual environmental awareness training		M	M	M	M	M	M	
Short induction								M
Adani EMS		M	M	AR	M		M	
Legal and other obligations	M	M	M	AR	M	AR	M	
Degree qualification – environmental management							M	
Dangerous goods storage and handling		AR	M		AR	AR	M	
Waste management and minimisation		M	M	M	M	M	M	
Spill prevention and response		M	M		M	M	M	
Fire fighting		AR	AR		AR	AR	AR	

Training	CEO	General Manager	Area Managers	Procurement Manager	Supervisors	Employees and Contractors	Environmental Managers and Officers	Visitors
Vegetation clearing and in-stream work procedures			M		M	AR	M	
Erosion and sediment control			M		M	AR	M	
Energy and water conservation, including vehicle operation to minimise energy consumption		M	M	M	M	AR	M	
Cultural heritage awareness and monitoring		M	M		AR	AR	M	
Work permit requirements		M	M		M	M	M	
Weed Hygiene					M	M	M	
Tool box talks – environmental topics including minor changes to compliance and management requirements and procedures	AR	M	M	M	M	M	M	M
Introductory training – new or substantially amended procedures		M	M	M	M	M	M	

M = mandatory

AR = As relevant to work requirements

3.7.2 External

External reporting is expected to be required in response to legislative requirements. Initial reporting requirements are set out in Table 3-10 and this will be updated based on conditions of approval.

Table 3-10 External Environmental Reporting Requirements

Reporting Trigger	Report Content	Report Recipient	Adani Responsibility
Annual return under environmental authority	Compliance with environmental authority requirements	Department of Environment and Heritage Protection (DEHP)	Mine General Manager
NGER	Energy consumption	Clean Energy Regulator	Mine General Manager
National Pollutant Inventory	Pollutant emissions	DEHP	Mine General Manager
Incidents causing actual or potential environmental harm	Incident investigation and corrective actions	DEHP	Environmental Manager

The Social Impact Management Plan (SIMP) (SEIS, Volume 4,Appendix D2) contains a broader stakeholder engagement plan, including:

- Engagement with local and regional emergency services representatives
- Complaints and inquiries.

In accordance with the *Corporations Act 2001*, Adani's annual report will include compliance with environmental requirements.

3.7.3 Internal – Adani Corporate

Corporate communications will take place in accordance with management system requirements.

3.7.4 Internal – Site

Within the Carmichael Coal Offsite Infrastructure area, communications regarding environmental matters will include:

- Environmental compliance, incidents, initiatives and corrective actions as agenda items in all management meetings
- Regular toolbox talks on environmental matters
- Environmental inductions and other training
- Incorporation of environmental risk assessment and management into all risk assessment activities
- Posting of information on environmental issues, impacts and performance on noticeboards

- Inclusion of environmental performance and issues in weekly, monthly and annual reports.

3.8 Documentation, Document Control and Records

Document control in relation to environmental management will be through the site EMS as set out in Adani Compliance Guideline CG-008 – Documentation and Document Control. This EMP and all associated sub plans, documents and registers will be controlled documents subject to unique document identifiers and version control. The corrective action register will be managed through a database to ensure that updates on the status of corrective actions are available to managers and supervisors.

Other documentation and records to be retained will include:

- Incident investigation reports
- Completed site checklists
- Records of training and induction
- Audit reports
- All monitoring records.

Monitoring records in relation to the environmental authority must be retained for five years and must be available for provision to the administering authority within 10 business days of any request.

The document control and records management system will meet the requirements of Adani's Management Standard ST-04 Documentation, Document Control and Records.

3.9 Work Permits

In accordance with the Adani Compliance Guideline CG-036 – Work Permits, any non-routine activities that might adversely affect the environment must not be performed without a work permit.

Non-routine works which have potential to cause environmental harm may include:

- Any ground disturbing activity
- Activities involving use of environmentally hazardous substances
- Activities in areas of native vegetation
- Activities in or immediately adjacent to streams and watercourses
- Activities within or adjacent to Category A or B environmentally sensitive areas
- Activities that might generate hazardous wastes or large quantities of non-hazardous wastes
- Activities carried out in close proximity to residential dwellings.

The following matters will be covered as part of the process of issue of a work permit:

- Any legislative approval requirements and whether these approvals are in place
- Conditions of approvals or permits that might apply to the activity
- Whether there are any cultural heritage, flora or fauna monitoring requirements
- Opportunities to minimise waste generation or energy consumption

- Measures to prevent environmental impacts, including:
  - Impacts on environmentally sensitive areas
  - Accidental clearing of vegetation
  - Erosion and sediment release
  - Accidental release of hazardous substances to land, water or air
  - Measures to prevent noise or dust emissions exceeding the environmental authority or other legislated requirements
  - Improper disposal of waste
- Any requirements in relation to incident response, such as spill kits and personal protective equipment (PPE).

During construction, environmental and approval requirements will be part of a quality system to ensure that all relevant approvals and other requirements are in place before construction commences.

4. Monitoring and Reporting

4.1 Summary of Environmental Monitoring Requirements

Environmental monitoring requirements are set out in each sub plan within this EMP provides a contextual summary of the require monitoring programs across the various project.

Table 4-1 Summary of Monitoring Requirements

Element	Pre-construction	Construction	Operation
Meteorology	✓	✓	✓
Air quality	✓	✓	✓
Greenhouse gas and energy		✓	✓
Noise and vibration		✓	✓
Surface water		✓	✓
Groundwater		✓	✓
General and hazardous waste		✓	✓
Terrestrial ecology	✓	✓	✓
Aquatic ecology	✓	✓	✓
Scenic amenity		✓	✓
Erosion and sediment control		✓	✓
Contaminated land		✓	✓
Topsoil management		✓	✓
Weed management	✓	✓	✓
Cultural heritage	✓	✓	✓

4.2 Checks and Inspections

4.2.1 Design and Preconstruction

During the design and pre-construction phase, monthly reviews will be undertaken against requirements of this EMP. A design checklist will be developed to document how design and pre-construction requirements have been met.

4.2.2 Construction and Operations

A formal site inspection will be conducted weekly by Adani's environmental team. Inspections will be carried out to assess project activities against compliance requirements set out in the environmental authority, other environment and planning approvals and this EMP.

Inspections will be documented on a checklist that will record whether the performance requirement for each item was achieved and corrective actions required to achieve the performance requirement. Where the non-conformance does not present a significant risk of environmental harm, and can be corrected promptly, the corrective action will be closed out on the checklist. Where the risk of environmental harm is more significant and/or the corrective action cannot be undertaken promptly, the action will be recorded in the corrective action register.

Where an incident or near miss is observed during checks, the incident investigation and reporting procedure will be followed.

Environmental inspection processes will meet the requirements of Adani's Management Standard ST-18 Reviews - Audits and Inspections.

4.3 Audits

4.3.1 Overview

Adani Compliance Guideline CG-004 – Audits and Assessments sets out requirements for audits of performance. An audit program has been developed to meet these requirements.

The following standards may be relevant to auditing activities:

- AS/NZS ISO 14012-1996 Guidelines for Environmental - Qualification Criteria for Environmental Auditors
- AS/NZS ISO 14015-2003 Environmental Management – Environmental Assessment of Sites and Organizations
- AS/NZS ISO/IEC 17021:2011 Conformity assessment - Requirements for bodies providing audit and certification of management systems
- AS/NZS ISO 19011-2003 Guidelines for Quality and/or Environmental Management Systems Auditing
- ISO 19011:2011 Guidelines for auditing management systems.

Draft audit reports will be reviewed by the Environmental Manager. Once an audit report is finalised:

- Audit reports will be circulated to the Mine General Manager and Area Manager
- Recommendations will be entered into the corrective action register
- Findings will be discussed at management meetings
- Where relevant, findings will be presented as tool box talks
- Reports and findings will be tabled at management reviews
- Any non-compliances that are required to be reported under legislation or conditions of approval will be reported.

Audits may be carried out in conjunction with audits for the Mine and Rail projects.

4.3.2 Construction

Auditing during construction will depend on the contracting strategy selected and whether contractors and subcontractors operate under Adani's management systems or the contractor's own environmental management system.

If contractors/subcontractors are utilising their own environmental management systems, Adani will conduct audits on a six monthly basis, or for shorter duration contracts, at least once during the contract duration. These audits will cover:

- Contractor's compliance with legal and other obligations
- Whether contractor's management plans have appropriately identified environmental impacts and risks
- Whether roles, responsibilities and training and competency requirements have been identified and followed
- Whether adequate management and control strategies are in place to achieve compliance with legal requirements and performance requirements documented in this EMP
- Whether management and control strategies are being implemented
- Monitoring approaches and outcomes, and identification and implementation of corrective actions
- Adequacy of record keeping and reporting.

It would also be expected that contractors will have internal and external audit programs.

If contractors and subcontractors are utilising Adani's management system, system compliance audits will be conducted based on agreed and approved audit requirements.

4.3.3 Operation

Environmental audit processes will meet the requirements of Adani's Management Standard ST-18 - Reviews, Audits and Inspections. A preliminary audit schedule for the Carmichael Coal Offsite Infrastructure has been developed and is shown in Table 4-2. Where audit outcomes and recommendations require corrective actions, these will be entered into the corrective action register.

Table 4-2 Preliminary Audit Schedule

Audit Type	Scope	Frequency
System audit	Audit against Adani EHS system requirements ISO 14001 accreditation audit	As agreed with certification body, externally no less than annually
Compliance audit	Confirm that legal and other obligations have been correctly and fully identified and that appropriate management and control strategies are in place and being implemented to meet requirements, including conditions of approval.	Bi-annual or if significant legislative changes occur
Waste audit	Review waste generation types and quantities and waste management practices and identify opportunities to further minimise waste generation or to reduce the environmental impacts associated with waste management.	Bi-annual

Audit Type	Scope	Frequency
Energy audit	Review energy consumption and identify opportunities to reduce energy consumption and/or associated greenhouse gas emissions. If greenhouse gas emission reduction programs are in place, review progress against commitments made. The audit must meet the requirements of AS/NZS 3598-2000 Energy Audits and requirements under the NGER Act and any other legislative requirements in relation to energy consumption and greenhouse gas emission reporting.	Annual
Environmental monitoring review	Review results of environmental monitoring activities including dust, groundwater, surface water, aquatic ecology and terrestrial ecology. Identify whether environmental performance requirements are achieved, and whether degradation of values or resources has occurred that may be attributable to the off-site infrastructure. Identify further investigations and/or corrective actions.	Annual
General environmental audit	Environmental impacts and risks have been correctly identified. Management controls are effective in managing the impacts and risks identified. EMP is consistent with environmental and planning permit conditions. Environmental management requirements are being implemented and evidence is available.	Six monthly

5. Reviews

5.1 Management Review

Adani's management system requires management reviews to be carried out at least twice per year (CG-011 – Management Review). Participants are to include Adani's senior management team.

In relation to the environmental component of the management review, the management review will examine:

- Adequacy and effectiveness of the EMP
- Compliance with Adani management system
- Opportunities for improvement
- Opportunities for waste minimisation.

Inputs to the management review will include:

- Results of monitoring and audits
- Status of achievement of performance requirements and indicators
- Summary of environmental incidents, non-compliances and complaints
- Status of corrective actions
- Communications and complaints
- Follow up of actions from previous management review
- Significant changes affecting environmental management, including legislation and policy changes.

Decisions and actions arising from the management review will be documented and actions will be entered into the corrective action register.

5.2 EMP Reviews

5.2.1 Annual Review

The EMP will be reviewed at least annually and updated to reflect:

- Changes in legislative requirements (including conditions of approvals)
- Environmental performance
- Outcomes of audits
- Outcomes of incident investigations
- Changes in external and internal policies, standards and guidelines
- Changes in requirements of Adani management system
- Any organisation changes such as changes in organisational structure
- Outcomes of the management review.

The review will ensure the continuing suitability, adequacy and effectiveness of the EMP and the Adani Management System. The review will include assessing opportunities for improvement.

Intermediate updates may also be undertaken in response to corrective actions or other changes that need to be addressed urgently.

Amendments to the EMP will be communicated to all staff through management meetings and tool box talks.

5.2.2 Review of Legal and Other Obligations

Legal and other obligations will be reviewed quarterly and whenever a major legislation or policy change occurs. The EMP will be updated as required to maintain compliance and any new requirements will be communicated to managers and staff through management meetings, special communications and tool box talks.

6. Air Quality

6.1 Legislative Framework

Air quality is managed through a framework established under the *Environmental Protection Act 1994*:

- The EP Act includes general objectives in relation to preserving environmental values in relation to air quality
- Under the EP Act, the *Environmental Protection (Air) Policy 2008* (EPP Air) is established and sets out objectives in relation to air quality.
- Under the EP Act, an environmental authority is required to undertake environmentally relevant activities, including a range of activities that may cause emissions to the air. In issuing an environmental authority, the regulator must have regard to the extent to which the activity meets the objectives established under the EPP Air. The environmental authority will then contain conditions in relation to air quality.

Occupational exposure to air contaminants is managed through the *Work Health and Safety Act 2011* and is not discussed further in this EMP.

The Commonwealth government has also established non-statutory air quality standards in the National Environmental Protection Measure (Ambient Air Quality).

The national pollutant inventory is established through a national environmental protection measure under the Federal *National Environment Protection Council Act 1994*. The Project will trigger thresholds for reporting a range of air emissions under this scheme, mostly due to the mining activities.

6.2 Environmental Values

Broad environmental values in relation to air quality are established in the EPP Air:

(a) The qualities of the air environment that are conducive to protecting the health and biodiversity of ecosystems;

(b) The qualities of the air environment that are conducive to human health and wellbeing;

(c) The qualities of the air environment that are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property; and

(d) The qualities of the air environment that are conducive to protecting agricultural use of the environment.

In relation to the offsite infrastructure, the key contaminant of concern is particulate matter. Relevant air quality objectives in relation to particulate matter at sensitive receptors is shown in Table 6-1.

Table 6-1 Ambient Air Quality Objectives and the Criterion for Dust Deposition

Pollutant	Objective (1)	Averaging period
Total suspended particulates	90 µg/m^3	Annual
Particulate matter <10 µm (PM_{10})	50 µg/m^3	24 hour
Dust deposition	120 mg/m^2/day	Monthly

(1) From EPP Air

The offsite infrastructure is located in an isolated rural area with a small number of sensitive receptors.

Particulate matter levels in the area are typical of moderate-low rainfall rural areas. Sources of atmospheric dust include wind-blown erosion (crustal dust) and smoke from fires.

6.3 Potential Impacts

6.3.1 Construction

Table 6-2 Potential Air Quality Impacts – Construction

Activity	Potential Environmental Impact
Vegetation clearing and earthworks	Particulate levels exceed air quality and dust deposition objectives at sensitive receptors during construction.
Sewage Treatment Plant	Odour emissions and gaseous chemical release.
Fuel Storage	Odour emissions and gaseous chemical release.
Vehicle operation	Particulate levels exceed air quality and dust deposition objectives at sensitive receptors.
Blasting	Particulate levels exceed air quality and dust deposition objectives at sensitive receptors.

6.3.2 Operations

Impacts on air quality are expected to be minimal during operation of the off-site infrastructure.

6.4 Performance Outcome

Meet EPP Air objectives for dust emission at sensitive receptors.

Not cause nuisance from dust deposition at sensitive receptors.

6.5 Proposed Controls

6.5.1 Design, Procurement and Pre-construction

Table 6-3 Air Quality Proposed Controls – Design, Procurement and Pre-construction

Control	Responsibility	Timing	Evidence
Install a meteorological monitoring station.	Environmental Manager	Prior to commencement of construction	Meteorological station in place
Plan construction activities and sequencing such that the area of exposed soils is minimised.	Construction Manager	Prior to commencement of construction	Earthworks schedule
Design temporary and permanent stockpiles (topsoil, spoil and coal) to minimise cross sectional area presented to the prevailing wind direction wherever space permits.	Design Manager	Prior to finalisation of detailed design	Design checklist
Identify obligations for NPI reporting and ensure that mechanisms are in place to collect required data.	Environmental Manager	Prior to commencement of construction	Monitoring records

6.5.2 Construction

Table 6-4 Air Quality Proposed Controls – Construction

Control	Responsibility	Timing	Evidence
Regularly service vehicles, plant and equipment such that exhaust systems and fuel consumption comply with manufacturers' specifications.	Construction Manager(s)	As per manufacturer's specifications	Vehicle logs
Minimise areas of exposed soil where possible.	Construction Manager	Ongoing	Earthworks schedule Visual inspection

Control	Responsibility	Timing	Evidence
Stabilise topsoil stockpiles if left in place for longer than four weeks. Methods may include covering and planting of native grasses or sterile grasses.	Construction Manager	Ongoing	Topsoil management register Visual inspection
Utilise water sprays to control dust on access tracks, work areas and stockpiles. Water may be sourced from raw water supply or treated wastewater. If treated wastewater is used, further protocols may be required to minimise worker exposure to water droplets.	Construction Manager	Ongoing	Visual inspection

6.5.3 Operations

There are no particular requirements for air quality during operations. If earthmoving activities are to be carried out, controls for the construction phase should be implemented.

6.6 Monitoring and Corrective Action

Table 6-5 Air quality monitoring and Corrective Action

Monitoring action	Responsibility	Frequency	Performance Requirement	Potential Corrective Action
Visually monitor minor access roads and other disturbed areas for dust lift off.	Supervisors Environmental Officers	Ongoing	Dust lift off is not travelling more than around 500 metres. Water trucks are actively applying water.	Increase application of water sprays. Rehabilitate or stabilise surfaces.
Monitor air emissions as required under the NPI scheme.	Environmental Manager	Annual	NPI report is submitted	NA

7. Greenhouse Gas Emissions

7.1 Legislative Framework

The legislative framework relevant to energy, carbon and greenhouse gas management includes:

- Commonwealth *Clean Energy Act 2011* – establishes the carbon pricing mechanism and deals with assistance for emissions intensive trade-exposed industries and the coal fired electricity generation sector
- Commonwealth *Energy Efficiency Opportunities Act 2006* – sets out requirements for large energy using businesses, and allows for regulations to provide detailed requirements for assessment, reporting, verification and other elements of the Australian Government energy efficiency program
- Commonwealth *National Greenhouse and Energy Reporting Act 2007*– establishes a national system for reporting greenhouse gas emissions, energy consumption and production by corporations from 1 July 2008
- Queensland *Clean Energy Act 2008* – an Act to improve the efficiency and management of the use of energy, and the conservation of energy, in relation to particular businesses and other activities.

7.2 Environmental Values

Environmental values in relation to greenhouse gas emissions are not site specific, but rather, relate to global accumulation of greenhouse gases at levels that may cause climate change.

7.3 Potential Impacts

Table 7-1 Potential Environmental Impacts – Construction and Operation

Activity	Potential Environmental Impact
Operation of vehicles, plant and equipment using diesel or electricity	Emissions of greenhouse gases to the atmosphere
Waste generation	Loss of embodied energy and resources
Vegetation clearing	Release of carbon stored in vegetation
Wastewater treatment	Release of methane

7.4 Performance Outcome

Minimise the greenhouse gas emissions intensity arising from construction and operation of the Project offsite infrastructure.

7.5 Proposed Controls

7.5.1 Design and Pre-construction

Table 7-2 Greenhouse Gas Emission – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Consider the following guidelines and rating schemes when designing buildings, infrastructure and other components: • Building Code of Australia requirements, including insulation, building materials and energy efficiency • National Australian Built Environment Rating System (NABERS) • Australian Green Infrastructure Council rating scheme • Green Building Council of Australia rating scheme.	Design Manager	During design	Design checklist Building and infrastructure specifications
Incorporate fuel and material efficiency requirements into the procurement strategy, including: • Appropriate sizing, maintenance and selection of equipment • Purchase of used equipment where this leads to reduced greenhouse gas emissions over the equipment life • Minimisation of packaging • Consideration of the energy efficiency ratings of equipment • Equipment, plant and vehicles that can use biodiesel.	Procurement Team	During procurement of equipment, plant and vehicles	Equipment, plant and vehicle specifications
Consider fuel consumption when planning transportation of materials and minimise transport distances wherever possible.	Procurement Team	During procurement of equipment, plant and vehicles	Equipment, plant and vehicle specifications

Control	Responsibility	Timing	Evidence
Note that registration of the Project with the National Greenhouse and Energy Reporting scheme and as a liable entity will be undertaken as part of the EMP (Mine).			

7.5.2 Construction

Table 7-3 Greenhouse Gas Emissions – Construction Controls

Control	Responsibility	Timing	Evidence
Driver and operator training in relation to efficient operation of vehicles, plant and equipment.	Construction Manager	As required	Training register
Operation of vehicles, plant and equipment to minimise diesel consumption and wear and tear on parts.	All staff	Ongoing	Diesel fuel consumption
Regularly service vehicles, plant and equipment such that exhaust systems and fuel consumption comply with manufacturers' specifications.	Construction Manager and Contractors	Ongoing	Vehicle maintenance records
Minimise transportation distances within the site wherever possible.	Construction Manager and Contractors	Ongoing	Diesel fuel consumption
Operate and maintain air conditioning systems in accordance with manufacturer's instructions and Guide to Best Practice Maintenance & Operation of HVAC Systems for Energy Efficiency (Council of Australian Governments National Strategy on Energy Efficiency January 2012).	Construction Manager and Contractors	Ongoing	Maintenance records
Select vehicle size for worker transport to match group size and use buses for transporting larger groups.	Construction Manager and Contractors	Ongoing	Diesel fuel consumption

7.5.3 Operations

Table 7-4 Greenhouse Gas Emissions – Operational Controls

Control	Responsibility	Timing	Evidence
Driver and operator training in relation to efficient operation of vehicles, plant and equipment.	Mine Manager	As required	Training register
Operation of vehicles, plant and equipment to minimise diesel consumption and wear and tear on parts.	All staff	Ongoing	Diesel fuel consumption
Regularly service vehicles, plant and equipment such that exhaust systems and fuel consumption comply with manufacturers' specifications.	Area Managers	Ongoing	Vehicle maintenance records
Minimise transportation distances within the site wherever possible	Area Managers	Ongoing	Diesel fuel consumption
Operate and maintain air conditioning systems in accordance with manufacturer's instructions and Guide to Best Practice Maintenance & Operation of HVAC Systems for Energy Efficiency (Council of Australian Governments National Strategy on Energy Efficiency January 2012).	Area Managers	Ongoing	Maintenance records
Select vehicle size for worker transport to match group size and use buses for transporting larger groups.	Area Managers	Ongoing	Diesel fuel consumption
Prepare and submit NGER reports (in conjunction with Mine).	Environmental Manager	Annually	Report

7.6 Monitoring and Corrective Action

Table 7-5 Greenhouse Gas Emissions – Monitoring and Corrective Action

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Conduct energy audits.	Environmental Manager	Annual or as required by legislation	Continuous improvement in energy use reduction	Review results and identify opportunities to reduce energy consumption and greenhouse gas emissions.
Monitor or estimate all scope 1 emissions: • Diesel consumption (litres) • Explosives use (mass used) • Wastewater treatment (volume treated) • Vegetation cleared (area and type).	Environmental Manager	Annually	Accurate and auditable account of all scope 1 emissions	Improve monitoring and estimation methods.
Monitor scope 2 emissions (electricity consumption).	Environmental Manager	Annually	Accurate and auditable account of all scope 2 emissions	NA

8. Noise and Vibration

8.1 Legislative Framework

Ambient and environmental noise is managed through a framework established under the *Environmental Protection Act 1994*:

- The EP Act includes general objectives in relation to preserving environmental values in relation to air quality.
- Under the EP Act, the EPP Noise is established and sets out objectives in relation to ambient noise levels and the acoustic environment.
- Under the EP Act, an environmental authority is required to undertake environmentally relevant activities, including a range of activities that may cause noise emissions. In issuing an environmental authority, the regulator must have regard to the extent to which the activity meets the objectives established under the EPP Noise. The environmental authority will then contain conditions in relation to noise.
- The EP Act also contains some requirements in relation to noise nuisance; however these are unlikely to be applicable at this location given the absence of sensitive receptors.

Occupational exposure to noise is managed through the *Work Health and Safety Act 2011* and is not discussed further in this EMP.

8.2 Environmental Values

Environmental values for the acoustic environment that are to be protected or enhanced are established in the EPP Noise as follows:

a. *The qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and*

b. *The qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—*

   (i) Sleep;
   (ii) Study or learn;
   (iii) Be involved in recreation, including relaxation and conversation; and

c. *The qualities of the acoustic environment that are conducive to protecting the amenity of the community.*

Sensitive receptors within or in close proximity to the offsite infrastructure, as outlined in the EPP Noise include dwellings and protected areas identified under the NC Act. The offsite infrastructure is located in an isolated rural area with a small number of sensitive receptors as follows:

- Dwellings
- The workers accommodation (within offsite infrastructure area)
- Labona homestead (approximately five kilometres from the offsite infrastructure area)
- Bygana, Lignum and Doongmabulla homesteads (greater than 15 km from the offsite infrastructure area).

Protected areas under the NC Act:

- Bygana West Nature Refuge (within the Mine area approximately 15 km from the offsite infrastructure area).

The existing noise environment is consistent with the quiet rural setting with background noise levels as shown in Table 8-1.

Table 8-1 Summary of Noise Monitoring Results

Location	Background L_{A90} dB(A)			Ambient L_{Aeq} dB(A)		
	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)	Day (7 am to 6 pm)	Evening (6 pm to 10 pm)	Night (10 pm to 7 am)
Location A Doongmabulla	31	31	27	48	41	43

8.3 Potential Impacts

8.3.1 Construction

Table 8-2 Potential Environmental Impacts – Construction

Activity	Potential Environmental Impact
Civil works during construction	Exceedance of noise levels at a noise sensitive place. Livestock and native animals are not expected to be affected by noise.
Construction related traffic	Noise from construction-related traffic is predicted to be within guideline levels but incremental increases in traffic noise levels may be perceptible at locations close to Gregory Developmental Road and along the Moray-Carmichael Road.
Pile driving, rock breaking and heavy equipment operation	Vibration levels are not predicted to affect any sensitive receptors.

8.3.2 Operations

Table 8-3 Potential Environmental Impacts – Operation

Activity	Potential Environmental Impact
Offsite infrastructure activities	Offsite infrastructure is not likely to cause any noise impacts on sensitive receptors in the area.
Operation related traffic	Noise from operation-related traffic is predicted to be within guideline levels but incremental increases in traffic noise levels may be perceptible at locations close to Gregory Developmental Road and along the Moray-Carmichael Road.
Airport	Noise from the airport has not been modelled.

8.4 Performance Outcome

No noise related complaints.

8.5 Proposed Controls

8.5.1 Design and Pre-construction

Table 8-4 Noise and Vibration – Design, Procurement and Pre-construction

Control	Responsibility	Timing	Evidence
Undertake a noise assessment of the airport, using the Australian Noise Exposure Forecast (ANEF) approach or similar. If unacceptable noise levels are predicted at any sensitive receptors, determine ameliorative measures including reorientation of the airport or measures at the sensitive receptor.	Design Manager	During detailed design	Design checklist

8.5.2 Construction

Table 8-5 Noise and Vibration – Construction Controls

Control	Responsibility	Timing	Evidence
If a noise or vibration complaint is received, follow the complaints and inquiries procedure set out in Section 22.	Stakeholder Manager	As required	Incident register

8.5.3 Operations

Table 8-6 Noise and Vibration – Operational Controls

Control	Responsibility	Timing	Evidence
If a noise or vibration complaint is received, follow the complaints and inquiries procedure set out in Section 22.	Stakeholder Manager	As required	Incident register

8.6 Monitoring and Corrective Action

Table 8-7 Noise and Vibration – Monitoring and Corrective Actions

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Undertake noise or vibration monitoring in response to a complaint	Environmental Manager	In response to a complaint	Noise levels do not exceed objectives	Implement noise attenuation or mitigation measures, such as: - Selection of quieter equipment or maintenance and modification of equipment to reduce noise emissions when operating in proximity to noise sensitive receptors - Grading haul roads to remove potholes and bumps - Use of broadband reversing alarms (audible movement alarms) rather than standard tonal reversing alarms - Partial or full enclosure of noisy stationary plant items - Use of earth mounds to block noise Measures may include those in AS2436:2010 *Guide to noise and vibration control on construction, demolition and maintenance sites*. Measures may also be taken at the sensitive receptor with agreement from the complainant.

9. Surface Water

9.1 Legislative Framework

There are two key pieces of legislation that govern surface water resources in Queensland.

The EP Act establishes the frameworks for managing water quality such that environmental values in relation to water quality are protected. This includes:

- The *Environmental Protection (Water) Policy 2008* which:
  - Identifies environmental values and management goals for Queensland waters (surface water and groundwater)
  - Establishes water quality goals and guidelines for waters
  - provides guidance on making consistent, equitable and informed decisions about waters
  - Includes requirements for monitoring of ambient water quality.
- Requirements for assessment and approval of activities (environmentally relevant activities) that might result in a discharge to surface waters or other impact on surface waters
- Provisions in relation to compliance with approval conditions in relation to impacts of activities on surface water resources
- Specific offences relating to contamination of surface waters.

The *Water Act 2000* (Water Act) regulates the sustainable use of water resources, including allocation of water resources for environmental benefits as well as activities that impact on the integrity of watercourses. Water resource plans (WRPs) define the availability of water for each basin in Queensland, and frameworks and mechanisms for sustainably managing water supply and demand. Resource operations plans then set out rules in relation to the allocation of water resources and other decisions made under the WRP. The Project Offsite Infrastructure is within the area covered by the *Water Resource (Burdekin Basin) Plan 2007*.

Water supply for the mine and offsite infrastructure comes from a combination of instream storages, groundwater bores and flood harvesting.

Under the Water Act:

- A water licence is required in relation to harvesting from instream storages, flood harvesting from the Belyando River and groundwater extraction
- A riverine protection permit is required in relation to works that disturb the bed and banks of a watercourse.

A watercourse is defined in the Water Act as a *river, creek or other stream, including a stream in the form of an anabranch or a tributary, in which water flows permanently or intermittently, regardless of the frequency of flow events—*

a. in a natural channel, whether artificially modified or not; or

b. in an artificial channel that has changed the course of the stream.(Water Act Section 48).

In practice, Department of Natural Resources and Mines (DNRM) will generally determine which of the waterways and drainage lines on the site constitute a watercourse under the Water Act definition.

Under the SP Act, development permits are required for installation of structures used to take water, including pumps and water storages.

9.2 Environmental Values

The offsite infrastructure area is located within the Belyando sub-catchment of the Burdekin Basin.

Two creeks, North Creek and Obungeena Creek run in a west to east direction to the north and south of the offsite infrastructure area. These creeks have existing instream farm dams. The two creeks are ephemeral drainage lines and become unchannelised downstream of the offsite infrastructure. The creeks eventually drain to the Belyando River.

9.3 Potential Impacts

9.3.1 Construction

Table 9-1 Potential Environmental Impacts – Construction

Activity	Potential Environmental Impact
Vegetation clearing and earthworks	Erosion and subsequent degradation of water quality.
Storage, handling and use of environmentally hazardous substances	Spills and leaks and subsequent degradation of water quality.
Extraction of water for water supply	A small reduction in downstream flow will occur, however this is not expected to be significant and will not affect availability of water to users and aquatic ecosystems.
Irrigation of treated wastewater	Contaminated surface runoff and subsequent degradation of water quality.

9.3.2 Operations

Table 9-2 Potential Environmental Impacts – Operation

Activity	Potential Environmental Impact
Storage, handling and use of environmentally hazardous substances	Spills and leaks and subsequent degradation of water quality.
Extraction of water for water supply	A small reduction in downstream flow will occur, however this is not expected to be significant and will not affect availability of water to users and aquatic ecosystems.
Irrigation of treated wastewater	Contaminated surface runoff and subsequent degradation of water quality.

Activity	Potential Environmental Impact
5 GL water storage dam	Dam failure may impact downstream environments and the Gregory Developmental Road. Population at risk has not been determined.

9.4 Performance Outcome

Water quality downstream of the offsite infrastructure area meets the following requirements:

- Total petroleum hydrocarbons are below detection level
- Turbidity is no more than 10% higher than the upstream value measured within 60 minutes
- Dissolved oxygen in flowing waters is no more than 10 per cent lower than the upstream value measured within 60 minutes
- Electrical conductivity in flowing waters is no more than 10 per cent higher than the upstream value measured within 60 minutes
- Nutrient levels are no more than 10 per cent higher than the upstream value.

9.5 Proposed Controls

9.5.1 Design and pre-construction

Table 9-3 Surface Water – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Obtain water licences for all extractions and development approvals for all structures.	Environmental Manager	Prior to construction of any water management infrastructure	Licences and permits in place
Conduct failure impact assessment on 5GL off-stream storage.	Design Manager	Prior to commencing design, with review during design as required	Failure Impact Assessment
Design off-stream storage in accordance with relevant requirements of Queensland Dam Safety Management Guidelines (DNRM 2002).	Design Manager	During design	Design check list
Drinking water to comply with the water quality management and planning requirements as outlined in the Australian Drinking Water Guideline (2004), Australian Guidelines for Water Recycling - managing health and environmental risks (Phase 1) (2006) and (Phase 2) as released by the National Environmental Protection Council.	Design Manager	During detailed design	Design checklist

9.5.2 Construction

Table 9-4 Surface Water – Construction Controls

Control	Responsibility	Timing	Evidence
If dams are required to be drained:	Construction	When draining dams	Water quality data and discharge records,

Control	Responsibility	Timing	Evidence
• Test water quality (pH, dissolved oxygen (DO), turbidity and electrical conductivity (EC)) • Utilise water for dust suppression as a first preference. If water cannot be used for dust suppression, then manage as follows: • If EC is less than 1,300 us/cm, pH is in the range 6.5-8.5, turbidity is less than 130 NTU and DO is above 4 mg/l, water may be pumped to the downstream watercourse. Pump rate should be such that water does not overflow the channel, scouring does not occur and suspended sediment from the base of the storage is not suspended. Monitor turbidity levels through and cease discharge if turbidity exceeds 50 NTU. • If DO is below 4 mg/L, discharge to watercourse may be possible with aeration, however care must be taken not to stir up sediment from the bottom of the storage such that turbidity exceeds 50 NTU. • If EC is less than 1,200 us/cm, use water for is to be irrigated such that ponding and runoff does not occur. • If EC is more than 1,300 us/cm, pH is outside the range 6-8.5, or turbidity exceeds 50 NTU, consider for irrigation of pasture areas or rehabilitation trials or transfer to another storage for later use.	Manager		permit to disturb.
Construct water storage structures in accordance with relevant requirements of Queensland Dam Safety Management Guidelines (DNRM 2002).	Construction Manager	During construction	RPEQ sign off or other documentation as required by guidelines

9.5.3 Operations

Table 9-5 Surface Water – Operational Controls

Control	Responsibility	Timing	Evidence
Conduct surveillance and maintenance on all water storage structures as per relevant requirements of the Queensland Dam Safety Management Guidelines (DNRM, 2002).	Area Manager	As per guidelines	Dam safety reports

9.6 Monitoring and Corrective Action

Table 9-6 Surface Water – Monitoring and Corrective Action

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Monitor water quality in watercourses upstream and downstream of the offsite infrastructure for: • DO (field) • pH (field) • Turbidity (field) • EC (field) • Total petroleum hydrocarbons (laboratory) • Nutrients (laboratory) All sampling to be undertaken in accordance with Monitoring and Sampling Manual 2009 Environmental Protection	Environmental Manager	At least four times during wet season	Total petroleum hydrocarbons are below detection level. Turbidity is no more than 10 % higher than the upstream value measured within 60 minutes. DO in flowing waters is no more than 10 % lower than the upstream value. EC in flowing waters is no more than 10% higher than the upstream value. Nutrient levels are no more than 10 % higher than the upstream value.	Raise an incident report and conduct an investigation into the cause of non-compliance with performance requirements.

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
(Water) Policy 2009 (current version).				

10. Groundwater

10.1 Legislative Framework

There are two key pieces of legislation that govern ground water resources in Queensland.

The EP Act establishes the frameworks for managing water quality such that environmental values in relation to water quality are protected. This includes:

- The *Environmental Protection (Water) Policy 2008* which:
  - Identifies environmental values and management goals for Queensland waters (surface water and groundwater)
  - Establishes water quality goals and guidelines for waters
  - Provides guidance on making consistent, equitable and informed decisions about waters
  - Includes requirements for monitoring of ambient water quality.
- Requirements for assessment and approval of activities (environmentally relevant activities) that might result in impacts on groundwater resources.
- Provisions in relation to compliance with approval conditions in relation to impacts of activities on ground water resources.

The *Water Act 2000* regulates the sustainable use of water resources, including allocation of water resources for environmental benefits as well as activities that impact on the integrity of watercourses. Water resource plans (WRPs) define the availability of water for each basin in Queensland, including the Great Artesian Basin (GAB), and frameworks and mechanisms for sustainably managing water supply and demand. Resource operations plans then set out rules in relation to the allocation of water resources and other decisions made under the WRP. The Project is within the area covered by the *Water Resource (Burdekin Basin) Plan 2007* and at the edge of the area covered by the *Water Resource (Great Artesian Basin) Plan 2006*.

Water licences are required for groundwater extraction which is part of the water supply strategy.

The *Water Supply (Safety and Reliability) Act 2008* regulates drinking water quality for the protection of public health. The legislation applied to drinking water service providers registered with the Department of Energy and Water Supply, particularly those involved in treating, transmitting or reticulating water for drinking purposes.

10.2 Environmental Values

In relation to the offsite infrastructure, there is limited information about groundwater resources. There are no groundwater dependent ecosystems in close proximity to the offsite infrastructure area. A small number of bores are in use for stock and domestic supply.

10.3 Potential Impacts

10.3.1 Construction

Table 10-1 Potential Environmental Impacts – Construction

Activity	Potential Environmental Impact
Dewatering of excavations	Drawdown of groundwater may occur, however most excavations are relatively shallow with respect to the groundwater levels, relatively small in volume and requiring dewatering only over a short period of time. Hence, impacts are not expected. Disposal of groundwater from dewatering has the potential to cause surface water degradation particularly if salinity is high.
Contamination from spills or leaks of environmentally hazardous substances	Large spills of environmentally hazardous materials or leaks that are allowed to continue over long periods of time may cause contamination of groundwater. Improper irrigation of treated wastewater may cause nutrients to leach to groundwater.

10.3.2 Operations

Table 10-2 Potential Environmental Impacts – Operation

Activity	Potential Environmental Impact
Water supply bores	Drawdown from water supply bores is not expected to affect any existing groundwater users or groundwater dependent ecosystems

10.4 Performance Outcome

Groundwater users are not adversely impacted in terms of availability of water for stock and domestic use

Impacts on groundwater dependent ecosystems do not cause loss of biodiversity values.

10.5 Proposed Controls

10.5.1 Design and Pre-construction

Table 10-3 Groundwater – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Determine trigger and compliance levels for groundwater quality and levels.	Environmental Manager	Prior to commencement of groundwater extraction	Trigger and compliance levels set

10.5.2 Construction

Table 10-4 Groundwater – Construction Controls

Control	Responsibility	Timing	Evidence
Identify presence and quality of groundwater in any areas where excavation is to occur and determine approach to managing groundwater from excavation such that degradation of surface water quality or land does not occur. Document management approach and monitoring requirements in the work permit application.	Construction Manager	Prior to any excavation more than 2 m below ground level	Work permit details
Check that work permit applications include appropriate measures for management of groundwater from excavations.	Environmental Manager	Prior to issuing permit	Work permit

10.5.3 Operations

There are no operational controls required in relation to groundwater.

10.6 Monitoring and Corrective Action

Table 10-5 Groundwater Monitoring and Corrective Actions

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Conduct baseline monitoring on monitoring bores, including: • Water levels • pH, DO, turbidity, EC, temperature (field and lab) • Total organic carbon • Major ions • Fluoride and sulfide • Nutrients • Dissolved metals.	Environmental Manager	Monthly for 12 months	12 data points available for determining trigger levels	NA
Conduct monitoring on monitoring bores, including: • Water levels • pH, DO, turbidity, EC, temperature (field and lab) • Total organic carbon • Major ions • Fluoride and sulfide • Nutrients	Environmental Manager	Annually	Trigger levels are not exceeded	Repeat monitoring immediately on receiving non-compliant results. If repeat results indicate persistent elevation, raise an incident report and commence incident investigation. Undertake corrective actions as identified in the incident investigation.

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
• Dissolved metals.				

11. General and Hazardous Waste Management

11.1 Legislative Framework

The key legislation in relation to waste management is the EP Act which identifies effective waste management strategies as part of an integrated management approach to environment protection and ecologically sustainable development and sets up requirements for minimisation, handling, transport, storage and disposal of wastes. Under the EP Act and EP Regulation, activities associated with waste management, including transport, treatment, storage and disposal of wastes are environmentally relevant activities and an authorisation is required to carry out these activities. Schedule 7 of the EP Regulation also defines regulated waste, being wastes that are particularly hazardous to the environment if not managed appropriately.

The *Environmental Protection (Waste Management) Regulation 2000* establishes procedures for tracking of certain regulated wastes. Trackable wastes are defined in Schedule 1 of this regulation and a docket system is in place to track these wastes from the point of origin to disposal.

Waste Reduction and Recycling Act 2011 (WRR Act) and Waste Reduction and Recycling Regulation 2011 strengthens waste management and resource recovery practices in Queensland. The WRR Act provides a framework for state wide waste management strategy and establishment of levies and other mechanisms to promote waste minimisation. The strategy identifies waste tyres from commercial and industrial activities as a high priority for waste minimisation and management.

The following Adani Compliance Guidelines also apply to waste management:

- CG-063 – Management of wastes
- CG-064 – Waste minimisation
- CG-065 – Waste recycling and reuse
- CG-066 – Waste treatment
- CG-121 – Waste disposal.

11.2 Environmental Values

Wastes represent lost or degraded material and energy resources.

Improper waste management can impact on a range of environmental values including land, air quality, surface water and groundwater. Improper waste management can also cause a range of public health hazards.

11.3 Potential Impacts

Types of wastes likely to be produced during construction and operation of the Project offsite infrastructure are listed in Table 11-1, together with potential environmental or public health impacts that may arise if wastes are not properly managed.

Table 11-1 Potential Environmental Impacts – Waste Generation

Waste type	Potential Environmental Impact (with no management)
Vegetation waste	Fire hazard
	Emissions of greenhouse gases as vegetation rots
	Possible loss of nutrients in natural nutrient cycles
	Spread of weeds
	Visual impact
	May harbour vermin (may also harbour native animals)
Packaging waste	Lost resource
	Visual impact
	Source of litter
	Plastics may entrap native animals
Waste concrete and concrete wash out waste	Localised increases in pH
	Lost resource
	Visual impact
Scrap metal	Loss of resource
	Visual impact
	Localised soil contamination with potential to leach to surface and groundwater
	Human health risk (tetanus)
Other building and demolition wastes	Loss of resource
	Visual impact
Waste oil and oil contaminated wastes	Contamination of soils, surface water and groundwater
	Toxicity to plants and animals
	Degradation of water resources
	Loss of resource
Waste solvents and paints	Contamination of soils, surface water and groundwater
	Toxicity to plants and animals
	Degradation of water resources
	Loss of resource
Office wastes	Litter
	Loss of resource

Waste type	Potential Environmental Impact (with no management)
Food wastes	May attract vermin Odour Disease, particularly through bacterial infection
Other domestic wastes	Loss of resource Litter Plastics may entrap animals
Wastewater (toilets, showers, kitchen, laundry) Sewage and water treatment plant sludge	Contamination of land, surface and groundwater Degradation of water resources Inhibition of native plant growth Increased nutrient levels in aquatic ecosystems, causing eutrophication and algal outbreaks Spread of disease Odour

11.4 Performance Outcome

Minimise generation of waste in accordance with the waste management hierarchy:

a. AVOID unnecessary resource consumption

b. REDUCE waste generation and disposal

c. RE-USE waste resources without further manufacturing

d. RECYCLE waste resources to make the same or different products

e. RECOVER waste resources, including the recovery of energy

f. TREAT waste before disposal, including reducing the hazardous nature of waste

g. DISPOSE of waste only if there is no viable alternative.

Avoid adverse impacts of waste on land contamination, surface and groundwater quality and visual amenity.

11.5 Proposed Controls

11.5.1 Design and Pre-construction

Table 11-2 General and Hazardous Waste Management – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Identify opportunities for waste minimisation and recycling in design of all components.	Design Manager	During design phase	Design checklist
Include requirements for minimisation of packaging waste in contract specifications for equipment, plant, consumables and other items.	Procurement Manager	Prior to commencement of construction	Contracts and specifications
Ensure waste contracts are in place for all wastes that require removal from the site for reuse, recycling, treatment and/or disposal. Utilise contractors that can offer reuse and recycling services in preference to those that cannot and ensure that all contractors hold appropriate authorisations to transport, receive, store, reprocess, treat and/or dispose of wastes expected to be generated.	Procurement Manager	Prior to commencement of construction	Requests for tenders, tenders received Contracts in place
Identify obligations for NPI reporting and ensure that mechanisms are in place to collect required data.	Environmental Manager	Prior to commencement of construction	Monitoring records
Select appropriate wastewater treatment system to achieve treatment levels that protect environmental values and allow maximum reuse of treated wastewater without creating health and safety issues.	Design Manager	Prior to commencement of construction	Design checklist
If treated wastewater is to be disposed of through irrigation, develop an effluent irrigation management plan based on soil testing and results of MEDLI modelling.	Design Manager	Prior to commencement of construction	Effluent irrigation management plan

Control	Responsibility	Timing	Evidence
Determine storage requirements for untreated and treated wastewater in the event of unforseen events such as malfunction of the wastewater treatment plant or wet weather.	Design Manager	Prior to commencement of construction	Design checklist

11.5.2 Waste Management Inventory

Table 11-3 presents waste storage and handling requirements and indicative waste management methods, in order of preference. Final waste management methods will depend on the availability of waste management contractors to provide a cost effective service to this location.

Table 11-3 General and Hazardous Waste Management

Waste type	Waste storage and handling requirements	Indicative waste management methods
Vegetation waste	Store so as to minimise fire hazard Separate logs and hollow trees Avoid mixing native vegetation with introduced vegetation where possible Store away from trafficked areas	Place logs and hollow trees in rehabilitated areas or areas of retained habitat. Mulch or otherwise treat native vegetation for reuse in revegetation areas (trials to be undertaken to determine best methods for reuse).
Packaging waste	Segregate plastic, wood and cardboard Flatten cardboard and store in low fire risk areas Contain plastics so that these do not blow away	Return packaging to source wherever possible. Mulch cardboard and wood for reuse in revegetation (subject to trials). Plastics and cardboard removed from site for recycling where viable.
Waste concrete and concrete wash out waste	Concrete wash out in designated areas away from watercourses	Crush waste concrete for reuse in road building if required.
Scrap metal	Segregate from other wastes	Offsite recycling if feasible.

Waste type	Waste storage and handling requirements	Indicative waste management methods
Other building and demolition wastes	Segregate from other wastes	Offsite recycling and/or disposal.
Waste oil and oil contaminated wastes	Store in sealed containers in a designated bunded area, away from sources of fire and watercourses.	Consider use of biological methods to treat oily waste and waste oils. Combine with oily wastes from offsite infrastructure. Removal by authorised oil recovery contractor if viable.
Waste solvents and paints	Store in sealed containers in a designated bunded area, away from sources of fire and watercourses.	Removal by authorised solvent recovery contractor if viable Consider distillation of solvents to recover usable solvents. Harden waste paints.
Office wastes	Print paper on both sides Segregate paper, cartridges, computer wastes Store paper in a closed container to avoid litter.	If feasible, remove wastes for recycling
Food wastes	Store in sealed containers	Removal by authorised contractor
Other domestic wastes	Store in enclosed containers	Removal by authorised contractor
Wastewater (toilets, showers, laundry, kitchen)	Storage capacity for untreated wastewater for at least three days. Kitchen wastes to pass through a grease trap or similar. Treat in one or more package wastewater treatment plants to Class A. Storage capacity for treated wastewater for up to 10 days.	Irrigate on pasture or revegetation areas (subject to soil investigations and MEDLI modelling). Use for irrigation of landscaped areas. Use for vehicle washing.

Waste type	Waste storage and handling requirements	Indicative waste management methods
Sewage and water treatment plant sludge	Store in fully contained receptacles in a designated area away from watercourses and flood plain areas.	Removal by authorised contractor for disposal.

11.5.3 Other Controls

Table 11-4 General and Hazardous Waste Management – Controls

Control	Responsibility	Timing	Evidence
Maintain a waste register, including the following information: • Waste type and waste code • Waste source • Potential contaminants and other environmental hazards • Quantity generated • Storage locations and requirements • Whether the waste is regulated and trackable • Waste avoidance or reduction measures in place • Management method (reuse, recycling, on-site disposal, offsite disposal) • Quantities removed for reuse/recycling/disposal • Relevant waste contractor. A combined waste register may be maintained for the mine and offsite infrastructure.	Procurement Manager	Continual	Waste register
For trackable wastes, waste register will include: • Consignment number for the load	Procurement Manager	Continual	Waste register

Control	Responsibility	Timing	Evidence
• Transport provider's details (including licence number) • Date and time trackable waste removed from Adani Mining's premises • Quantity removed • Receiver's details (including licence number).			

11.6 Monitoring and Corrective Action

Table 11-5 General and Hazardous Waste Management Monitoring and Corrective Action

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Review waste register for waste avoidance, reuse, recycling or other minimisation opportunities. Identify trends in waste generation and check that appropriate storage, handling and management measures are in place for each waste type.	Environmental Manager	Annually for first five years and then every second year	Waste avoidance and minimisation opportunities are maximised	Review on-site procedures and incorporate waste avoidance and minimisation measures. Amend waste contracts to maximise reuse and recycling in preference to disposal.
Monitor wastes as required under the NPI scheme.	Environmental Manager	Annual	NPI report is submitted	NA

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Implement monitoring requirements as set out in effluent irrigation management plan.	Environmental Manager	As per effluent irrigation management plan	As per effluent irrigation management plan	Adjust treatment methods. Adjust irrigation regime.
Review waste contracts	Procurement Manager	Annual	Waste contractors are properly authorised to transport, treat and dispose of waste. Waste contracts maximise reuse and recycling of waste over disposal where practical.	Utilise only contractors with proper authorisations for waste management services. Amend waste contracts to maximise reuse and recycling in preference to disposal.
Track cost savings achieved by waste reduction and include in budget as a cost recovery.	Procurement Manager	Annually	NA	NA

12. Terrestrial Ecology

12.1 Legislative Framework

Terrestrial ecosystem values are protected by Federal and State legislation.

The Commonwealth EPBC Act provides protection for MNES including listed threatened species, listed migratory species and threatened ecological communities. The offsite infrastructure must proceed in accordance with conditions of approval under this Act. Offsets are required where significant impacts on MNES are unavoidable.

The *Vegetation Management Act 1999* protects remnant native vegetation and approval is required to clear this. Endangered and of concern vegetation must be offset under this Act.

In Queensland, the NC Act also provides a framework for protecting all native plants and animals including threatened species, breeding places and habitat.

The Queensland *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act) identifies declared pest plant and animal species and provides for their control. The LP Act imposes a legal responsibility on all landowners to control declared species on their land (subject to certain conditions).

12.2 Environmental Values

The offsite infrastructure area is largely dominated by the open cleared land habitat type, and thus provides limited habitat values for native fauna species. A number of small patches of remnant vegetation are present within the proposed offsite infrastructure area, and are typically mapped as part of a mixed vegetation community of ironbark-box woodland in conjunction with gidgee or brigalow shrubby woodland.

Riparian vegetation is associated with the Belyando River and to a lesser extent ephemeral creeks in the area.

12.3 Potential Impacts

Table 12-1 Potential Environmental Impacts – Terrestrial Ecology

Activity	Potential Environmental Impact
Vegetation clearing	Loss of native plants and vegetation communities. Loss of low grade habitat for native animals, including some threatened species. Injury or mortality to native animals. Degradation of adjacent habitat due to dust deposition, changes in overland flow regimes, exposure of edges to sunlight and increased predation. Proliferation of weeds and pests, including class 2 declared weeds and pests under the LP Act. Proliferation of exotic pasture grasses including buffel grass (*Cenchrus ciliaris*), which may impact the habitat quality for EPBC Act listed species including black-throated finch (southern) and squatter pigeon (southern).

Activity	Potential Environmental Impact
Works in and adjacent to watercourses	Loss of or degradation of surface water resources utilised by native animals.
General site activities	Introduction of new weeds and pests
	Spread of weeds and pests across the site
	Noise and light
	Changed fire regime

12.4 Performance Outcome

No unapproved loss in biodiversity values over and above those impacts permitted through project approvals and implementation of offset requirements.

12.5 Proposed Controls

12.5.1 Design and pre-construction

Table 12-2 Terrestrial Ecology – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
General requirements			
Prepare offsets management plan.	Environmental Manager	Prior to any vegetation clearing	Offsets management plan
Design lighting systems to minimise light spill into areas of native vegetation.	Design Manager	During detailed design	Design checklist
Review clearing requirements for offsite infrastructure and identify opportunities to reduce clearing of native vegetation and utilise existing cleared areas wherever possible.	Design Manager	During detailed design	Design checklist
Identify facilities and resources in the region for assistance in the event that native animals are injured and develop procedures for response to native animal injuries that avoid unnecessary suffering of animals.	Environmental Manager	Prior to any vegetation clearing	Injured animal procedures
Pre-clearing surveys are to be undertaken in accordance with the Species Management Program (Least Concern, Special Least Concern and Colonial Breeders) (SEIS Volume 4, Appendix C3).	Construction Manager / Environmental Manager	Prior to construction	Fauna Survey Fauna Relocation Register
Pre-clearing surveys are to be undertaken in accordance with the Threatened Species Management Program (SEIS Volume 4, Appendix C3). • Should the clearing be unavoidable during the breeding season, a suitably qualified ecologist to undertake a pre-clearing survey of native vegetation and habitat in the non-breeding season prior to the clearing activities to search for inactive breeding places of	Construction Manager / Environmental Manager	Prior to construction	Fauna Survey Fauna Relocation Register

Control	Responsibility	Timing	Evidence
applicable species. Where possible, inactive breeding places (i.e. nests, hollows and burrows) will be removed and relocated into adjacent habitat and placed at a similar height. Those inactive breeding places (i.e. hollows) left in site will be barricaded to avoid re-colonisation by fauna before the clearing commences. • 24 hours prior to clearing activities a pre-clearing survey of native vegetation and habitat will be undertaken by a licensed spotter-catcher to check for presence of applicable species, as well as their breeding places (i.e. nests, hollows, burrows). Hollow bearing trees identified for removal will be thoroughly searched by a licensed fauna spotter-catcher using cherry-pickers, cameras on poles or spotter-catcher with tree climbing certificates.			
Weed and Pest Management			
Equipment manufacturers to be informed of AQIS quarantine requirements. If packing materials are found to be contaminated at the site of unpacking, then they are to be removed and taken off-site to a licensed facility for disposal at the manufacturer's expense.	Procurement Team	During procurement	Purchasing records
A site specific weed management plan is to be prepared identifying the location of existing weeds, appropriate control measures to be implemented across the project and the identification of temporary and permanent wheel wash locations across the project.	Environmental Manager	3 months prior to construction commencing	Weed Management Plan
Adani will develop a pest control program for the management of feral cats, pigs and cane toads.	Environmental Manager	Prior to construction commencing	Pest Control Program

12.6 Construction and Operations

Table 12-3 Terrestrial Ecology – Construction and Operational Controls

Control	Responsibility	Timing	Evidence
Implement offset strategy and management plan.	Environmental Manager	Ongoing	Offset areas in place as per offset strategy
Where clearing is to take place in remnant native vegetation, conduct pre-clearing surveys. Surveys are to include: • Searches for breeding places or habitat • Searches of micro habitat for reptiles.	Environmental Manager	During the wet season immediately prior to clearing	Survey results
Determine requirements to manually relocate species from areas to be cleared based on pre-clearing survey results and conduct relocations as required.	Environmental Manager	Prior to clearing	Records of translocations
Based on pre-clearing survey results, determine any particular requirements in relation to clearing and document in permit to disturb application. Requirements may include: • Presence of a spotter catcher • Clearing in a particular direction to allow animals to escape • Felling of habitat trees separately to general clearing • Salvage of habitat features • Mulching of vegetation.	Construction Manager/Area Manager	Prior to clearing	Permit to disturb specifies optimal clearing approach
Clearly delineate areas for vegetation clearing and ensure that all personnel involved are aware of the clearing limits.	Construction Manager/Area Manager	Prior to clearing	Clearing limits delineated
Conduct pest control program for feral cats, pigs and cane toads.	Environmental Manager	Annually	Records of control program.

Control	Responsibility	Timing	Evidence
Vehicles and equipment are to be cleaned before being brought to site and inspected on entry to site. Queensland Government Checklist for Cleandown Procedures (2000) to be followed for clean down and inspection (http://www.daff.qld.gov.au/documents/Biosecurity_EnvironmentalPests/IPA-Cleandown-Procedures.pdf).	Construction Manager/Area Manager	Whenever vehicles or equipment are brought to site	Weed hygiene declaration form
All soil and materials of plant origin to be certified as weed free by the supplier using the Queensland Government weed hygiene declaration form or similar (http://www.daff.qld.gov.au/4790_7075.htm).	Construction Manager/Area Manager	Whenever soil or plant materials are brought to site	Weed hygiene declaration form
Drag any road kill to the side of the road immediately and arrange for collection and disposal.	All personnel	Ongoing	Road kill removed from roads
Report injured animals to Environmental Manager/Officers.	All personnel	Ongoing	Incident records
Respond to injured animals as per procedures developed.	Environmental Manager	As required	Incident record

12.7 Monitoring and Corrective Action

Table 12-4 Terrestrial Ecology Monitoring and Corrective Actions

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Conduct monitoring of offset areas.	Environmental Manager	As per offset strategy and management plan	As per offset strategy and management plan	As per offset strategy and management plan
Conduct inspections of disturbed areas for weed proliferation.	Environmental Manager	Annually	Weed levels in disturbed areas are similar to pre-clearing	Conduct a weed control program. Control programs will prioritise class 2 declared weed species listed under the LP Act that are known to occur within the Isaac Regional Council area including:

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
				• Bellyache bush • Chinee apple • Giant rat's tail grass • Harrisia cactus • Hymenachne (aquatic sp.) • Mother of millions • Parkinsonia • Prickly acacia • Prickly pear • Rubber vine • Salvinia • Tobacco weed Additional information and a copy of Isaac Regional Council's Pest Management Plan (27 June 2013) is located at http://www.isaac.qld.gov.au/c/document_library/get_file?uuid=00d7553f-4216-4a32-a00a-26043ccfcc8d&groupId=12238 Proliferation of exotic pasture species, including buffel grass (*Cenchrus ciliaris*) will also be monitored in disturbed areas due to potential impact on habitat quality for EPBC Act listed species.

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Check for pest plants and fauna.	Environmental Manager	Annually	Weed and pest animal levels are similar to pre-development	Conduct a weed and pest control program.
Monitor pest animal numbers in disturbed areas and key water resource locations.	Environmental Manager	Quarterly	No increase in pest animal occurrence	Conduct a pest animal control program. Control programs will prioritise class 2 declared pest species listed under the LP Act that are known to occur within the Isaac Regional Council area including: • Dingo/ wild dog • European fox • European rabbit • Feral cat • Feral chital and rusa deers • Feral pig • Migratory and spur-throated locusts.
Monitor road kill/injury statistics	Environmental Manager	Annually	No particularly high occurrences of animal death/injury	Provide fauna crossing or other control to protect animals from harm.

13. Aquatic Ecology

13.1 Legislative Framework

Legislative requirements in relation to aquatic ecosystems include:

- The EPBC Act protects a range of animals and plants that occur in aquatic environments.
- The EP Act and associated EPP Water recognise aquatic ecosystem health as a water quality value and set objectives for protection of aquatic ecosystems.
- The *Water Act 2000* includes requirements in relation to protection of watercourses, including a requirement for works in the bed and banks of watercourses and a water licence for diversion of water courses.
- The *Fisheries Act 1994* protects fish and fish habitat. Matters regulated by the *Fisheries Act 1994* include maintaining fish passage and creating a waterway barrier and an approval is required for raising a waterway barrier, unless codes can be complied with.

13.2 Environmental Values

North Creek and Obungeena Creek are ephemeral watercourses that flow in a west to east direction through to the north and south of the offsite infrastructure area. The creeks become unchannelised further downstream but flows eventually discharge to the Belyando River. Both creeks have existing water storages constructed.

13.3 Potential Impacts

13.3.1 Construction

Table 13-1 Potential Environmental Impacts – Construction

Activity	Potential Environmental Impact
Construction of pipelines and access roads in watercourses	Loss of aquatic habitat Changes in downstream flows Scouring and degradation of bed and banks Changes in geomorphological form in downstream areas due to scouring or sediment deposition.
Construction of pump station in Belyando River	Scouring and degradation of bed and banks Minor loss of aquatic habitat.
Water quality degradation	See Section 9.

13.3.2 Operations

Table 13-2 Potential Environmental Impacts – Operation

Activity	Potential Environmental Impact
Extraction of water from Belyando River	Slightly reduced flows in flood events.
Water quality degradation	See Section 9.

13.4 Performance Outcome

Downstream habitats are not degraded by sediment deposition, scouring or water quality degradation.

Downstream flow changes remain within natural fluctuations.

13.5 Proposed Controls

13.5.1 Design and Pre-construction

Table 13-3 Aquatic Ecology – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Review clearing requirements for offsite infrastructure and identify opportunities to reduce disturbance to watercourses, avoid removal of mature trees if possible and utilise existing disturbed cleared areas wherever possible.	Design Manager	During detailed design	Design checklist
Establish control and impact monitoring sites on North Creek and Obungeena Creek.	Environmental Manager	Prior to construction	Aquatic ecology monitoring program
Plan works in watercourses to minimise the period of disturbance to the watercourse.	Construction Manager	Prior to construction	Schedule
Schedule works in watercourses to occur outside wet periods wherever possible.	Construction Manager	Prior to construction	Schedule
As far as practicable, design watercourse structures such as culvert crossings, bridges and bed level crossings in accordance with: • Code for self-assessable development Minor waterway barrier works – Part 3 culverts (WWBW01) (DAFF, April 2013) • Code for self-assessable development Minor waterway barrier works – part 4 – bed level crossings (WWBW01) (DAFF, April 2013) • Code for self-assessable development Temporary Waterway Barrier Works (WWBW02) (DAFF, April 2013) •	Design Manager / Environment Manager	During detailed design	Design checklist

13.5.2 Construction

Table 13-4 Aquatic Ecology – Construction Controls

Control	Responsibility	Timing	Evidence
Avoid undertaking works in streams in times of flow wherever possible.	Construction Manager	During construction	Schedule
Locate temporary lay down areas, parking areas and refuelling areas at least 100 m from any defined watercourse.	Construction Manager	During construction	Inspections
For buried pipeline crossings and in-stream pump offtakes, ensure that design requirements are met during construction and: • Remove topsoil and vegetation and set aside for reinstatement • Place pipelines such that the bed level of the stream will be restored once backfilling is complete • Backfill trenches with material in a similar order to naturally occurring material • Replace topsoil	Construction Manager	During construction	Stable work areas
For culvert and low level crossings for access roads, ensure that design requirements are met during construction and: • Remove topsoil and vegetation and set aside for reinstatement • Place culverts or pipes such that the bed level remains even • Use topsoil and vegetation in rehabilitation Stabilise completed surfaces with “soft” techniques such as jute matting or geotechnical fabric as far as practicable.	Construction Manager	During construction	Stable work areas
Ensure that all earthmoving equipment has undergone correct wash-down procedures to minimise the risk of introducing hymenachne	Construction Manager/	During Construction	Weed hygiene declaration

Control	Responsibility	Timing	Evidence
(*Hymenachne amplexicaulis*) (WONS and Class 2 declared pest plant) to aquatic environments with the offsite infrastructure area.	Environment Manager		

13.5.3 Operations

Note that operational controls in relation to erosion and sediment control, subsidence management, surface water management and groundwater management are relevant to protecting downstream aquatic ecosystem values.

Table 13-5 Aquatic Ecology – Operation Controls

Control	Responsibility	Timing	Evidence
Aquatic weed infestations will be identified and managed in accordance with the Isaac Regional Council Pest Management Plan and the weed and pest management control strategies detailed within this EMP (Offsite).	Environmental Manager	During operations	No increase in existing infestation or the occurrence of new infestations
Staff will be informed via a site specific induction of the aquatic species that are likely to be encountered within the Project Area	Environmental Manager	During operations	Induction training records
Wash-down of plant, machinery and vehicles will be undertaken in designated and controlled locations where waste water and weed seed material will be captured and prevented from discharging to watercourses.	Environmental Manager	During operations	Designated weed wash-down areas Weed hygiene declaration

13.6 Monitoring and Corrective Action

Table 13-6 Aquatic Ecosystems – Monitoring and Corrective Actions

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Monitor aquatic ecology in response to a significant event.	Environmental Manager	Monitoring to take place towards the end of the wet season		If result of an incident, investigation carried out to determine cause and develop corrective actions.
Monitor aquatic monitoring sites for the presence of aquatic weeds.	Environmental Manager	Biannually once operations commence	No statistically significant changes in existing infestations or evidence of the introduction of new aquatic weeds for each monitoring site.	If significant differences are observed, an incident should be logged and an incident investigation carried out to determine cause of changes and develop corrective actions.

14. Biosecurity Management

14.1 Legislative Framework

Legislative requirements in relation to biosecurity include:

Commonwealth Legislation

***Environment Protection and Biodiversity Protection Act 1999* (EPBC Act)**

Under the EPBC Act, the Commonwealth can, among other things, list key threatening processes, develop and implement threat abatement plans (TAPs) and outline recovery plans to manage and reduce the impact of invasive species. As defined by SEWPaC, invasive species include diseases, fungi and parasites, feral animals, insects and other invertebrates, introduced marine pests and weeds.

Weeds

The Australian Weeds Strategy (DEWR, 2007) outlines a coordinated strategy for weed management across Australia. It provides consistent guidance on weed management and identifies Weeds of National Significance (WONS), which are nationally agreed priority plants for control and management. Twenty WONS are outlined in the Australian Weeds Strategy (DEWR, 2007); with an additional 12 included in April 2012. The strategy also addresses roles and responsibilities for weed management, outlining the various roles of government (national, state and local), industry and individuals in weed management. The following TAPs for weeds are of relevance to the Project (Mine):

- Threat abatement plant to reduce the impacts of northern Australia's biodiversity by the five listed grasses (SEWPaC, 2012)

Pest animals

The Australian Pest Animal Strategy (DEWR, 2007) outlines a national strategy for the management of vertebrate animals in Australia. This strategy outlines that it is the landholder's responsibility to detect and report new occurrences of pest animals and manage pest animals on their own land. Landholders also have a responsibility to management pest animal problems on their own land and where relevant, plan pest animal management activities jointly with neighbours. The following TAPs for pest species are of relevance to the Project (Offsite):

- Threat abatement plan for competition and land degradation by unmanaged goats (DEWHA, 2008)
- Threat abatement plan for competition and land degradation by rabbits (DEWHA, 2008)
- Threat abatement plan for predation by European red fox (DEWHA, 2008)
- Threat abatement plan for predation by feral cats (DEWHA, 2008)
- Threat abatement plan for the habitat degradation, competition and disease transmission by feral pigs (DEWHA, 2005)
- Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads (SEWPaC, 2011)

Diseases, fungi and parasites

Invasive diseases, fungi and parasites can have negative impacts on both biodiversity and agricultural crops. Due to the presence of threatened species within the Project (Mine) and the location of the Project within an agricultural landscape, it is vital that the Project does not introduce or spread diseases, fungi and parasites within the region. The following TAPs for diseases, fungi and parasites are of relevance to the Project (Mine):

- Beak and feather disease affecting endangered psittacine species (DEH, 2005).
- Threat abatement plan for infection of amphibians with chytrid fungus resulting in chytridiomycosis (DEH, 2006).

Quarantine Act 1908

The *Quarantine Act 1908* outlines a framework for the prevention or control of the introduction, establishment or spread of diseases or pests that will or could cause significant damage to human beings, animals, plants or other aspects of the environment or economic activities. Although a Commonwealth Act, the Queensland Department of Agriculture, Fisheries and Forestry administer the *Quarantine Act 1908* in Queensland.

State Legislation

***Land Protection (Pest and Stock Route Management) Act 2002* (LP Act)**

The LP Act is the primary piece of legislation for the management of weeds, pest animals and stock routes in Queensland. The Act provides for the management of particular pests in Queensland by declaring animals and plants to be declared pests, providing for pest management planning and establishing principles of pest management (on land). The LP Act also restricts the introduction, keeping or sale of declared pests and precents the spread of declared pests in the State.

Land Protection (Pest and Stock Route Management) Regulation 2003 (LP Regulation)

The LP Regulation supports the policy objectives outlined in the LP Act. The LP Regulation declares pest plant and animal species for control and management. The LP Regulation also provides current listings of all declared pest plant and animal species under the LP Act.

Land Act 1994

The *Land Act 1994* outlines a duty condition that it if a lease is issued for agricultural, grazing or pastoral purposes, the lessee must take reasonable steps to manage any declared pests.

Plant Protection Act 1989

The *Plant Protection Act 1989* aims to prevent, control and remove pest infestations of plants.

The whole of Queensland is a declared pest quarantine area for the following species:

- Banana freckle
- Tropical race 4
- Fire ant
- Fire blight
- Grape phylloxera. As the Project is within a grape growing area, the Project occurs within the Special Control Zone for this pest.
- Mediterranean fruit fly
- Potato pest

- Asian sugarcane planthopper
- Branched broomrape
- Mango malformation disease.

The Project is also located within the southern buffer pest quarantine area for pests of banana plants other than tropical race 4 or banana freckle and within a quarantine area for the sugarcane pest plant.

Agricultural Chemicals Distribution Control Act 1966

May be relevant when using aerial control of spur-throated locust (*Austracris guttulosa*) and Migratory locust (*Locusta migratoria*) both Class 2 Declared Pest species under the LP Act

Pest Management Act 2001

The *Pest Management Act 2001* provides for the regulation of health risks associated with pest control activities and the adverse results of ineffective control of pests. Also establishes a licensing regime to regulate pest control activities and ensure that activities are carried out by pest management technicians in a safe and competent way. Contractors commissioned to undertake pest control within the Project (Offsite) will be required to hold current a current licence under this Act.

Land Protection (Pest and Stock Route Management) Act 2002 **(LP Act)**

Land Protection (Pest and Stock Route Management) Regulation 2003

Provides legislative measures to manage pests and address the impacts they have on the economy, the environment and society.

Landowners, including state agencies, are required to control declared pest plants consistent with guidelines and local government area pest management plans and the Queensland Weeds Strategy 2002-06.

Under the Local Law provisions of the *Local Government Act 1993*, a local government can declare any plants not declared under the LP Act and enforce their control.

The *Land Act 1994* also has provisions requiring control of weeds declared under the LP Act on leasehold land.

14.2 Environmental Values

The Project Area contains a range of fauna habitat types that share broadly similar habitat values (based on habitat structure), but vary in their value for wildlife based on the specific forage and shelter resources they provide. Ironbark-box woodland was the most widespread fauna habitat type at the Project Area. In general, across the Project Area, disturbance to fauna habitats from cattle, weeds and feral animals was observed to be low. These disturbances were mainly observed in cleared areas, where ecological value is relatively low, between the Carmichael River and the Moray Carmichael Road, and in eastern parts of the Project Area.

Eight introduced fauna species comprising six mammals, one bird and one amphibian were also recorded during field studies including the following notable species:

- Feral cat
- Pig
- Cane toad
- Dingo

- House mouse
- European rabbit.

Native flora species were prevalent across much of the Project Area, in association with areas of remnant vegetation. Field studies identified 373 native flora taxa and 27 introduced taxa in the Project Area. Of the 27 introduced species, five are declared WONS and declared weeds under the Queensland LP Act.

Despite the agricultural land use within and surrounding the EPC 1690 Study Area, in general the prevalence of weeds, introduced animals and disturbances associated with cattle (i.e. loss of vegetative cover, compaction of ground, degradation of riparian areas and waterways) was observed to be relatively low. In localised areas, the level of disturbance observed was relatively higher – for example in the vicinity of cattle water points (farm dams, some stock troughs), and parts of the riparian zone of the Carmichael River. Habitats at the site characterised by remnant vegetation retained connectivity across much of the EPC 1690 Study Area (and beyond).

During the field surveys, 22 introduced species were recorded, of which two species are 'declared plants' under the LP Act, one of which, Parthenium weed (Parthenium hysterophorus), is a WONS. These species are outlined below:

- Parthenium weed (*Parthenium hysterophorus*)
- Prickley pear (*Opuntia stricta*)

Increased movement of people, vehicles, machinery, vegetation waste and soil may facilitate the spread of weeds at and near the Project Area. Five WONS that are also declared plants under the LP Act (parkinsonia (*Parkinsonia aculeata*), parthenium, prickly pear, velvety tree pear (*Opuntia tomentosa*) and rubber vine (*Cryptostegia grandiflora*)) are known to occur at the Project Area. Despite the fact that 27 introduced plant species were recorded, weeds were not found to be abundant across much of the Project Area.

14.3 Potential Impacts

Table 14-1 Potential Environmental Impacts

Activity	Potential Environmental Impact
Vehicle movements	Increased movement of people, vehicles, machinery, vegetation waste and soil may facilitate the spread of weeds at and near the Project Area. Five WONS that are also declared plants under the LP Act (parkinsonia (*Parkinsonia aculeata*), parthenium, prickly pear, velvety tree pear (*Opuntia tomentosa*) and rubber vine (*Cryptostegia grandiflora*)) are known to occur at the Project Area. Increasing the prevalence of weeds at the Project Area (and potentially beyond to the surrounding landscape), may reduce the quality of habitats for some flora and fauna species, particularly by replacing native plants.

Activity	Potential Environmental Impact
Construction activities	Vegetation clearing and soil disturbance allows seeds present in soil to germinate. Germination and plant growth for weeds is typically faster than for native species and this can lead to increased weed levels in disturbed areas and affect the ability for native vegetation to re-establish. There is also significant potential for weeds, either as seeds or other plant propagules, to be introduced to sites attached to dirty vehicles and equipment or to be contained in soil or seed mixes brought to the site. This can lead to increased levels of weeds already present on the site, or infestation by new weeds.
Ongoing operations	An increase in the prevalence of these animals may adversely impact native fauna in that it may lead to: • Increased competition for resources • Increased predation of native species by introduced animals • Habitat degradation including pig damage of riparian areas and erosion caused by rabbit burrowing.

14.4 Performance Outcome

No increase or spread of weeds beyond pre development conditions as a result of project activities.

No unapproved biosecurity management activities.

14.5 Proposed Controls

14.5.1 Design, Procurement and Pre-construction

Table 14-2 Biosecurity – Design, Procurement and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Weed mapping will be undertaken prior to commencement of construction. Mapping will cover the whole site but be particularly focused at high risk locations, such as areas of black soil so that weed hotspots can be identified. Baseline field surveys of identified hotspots within and near construction areas will be undertaken prior to commencement of construction. Weed control will be undertaken in areas that are very heavily infested or where WONS or Class 1 or 2 weeds declared under the LP Act are present prior to disturbance.	Environmental Manager	Prior to Construction	Weed Mapping Report

14.5.2 Construction and Operation

Table 14-3 Biosecurity – Construction and Operational Controls

Control	Responsibility	Timing	Evidence
Waste management measures should include containment of food scraps in securely sealed containers.	Camp Manager	During Construction and Operations	Compliance
Vegetation and soil waste should not be moved to areas of lower weed infestation.	Construction Manager	During Construction and Operations	Site Management Plans No spread of infestations
Pest animal occurrence will be monitored during construction. If increased densities of pest animals are observed, or new pest animals are identified, humane pest controls will be implemented to manage numbers.	Environmental Manager	During Construction and Operations	Monitoring records and logs

Control	Responsibility	Timing	Evidence
Monitoring will be undertaken annually during construction, with results to be considered in terms of baseline information (collected prior to construction) and with reference to appropriate control (reference) sites. If significant infestations of any weeds occur, or if WONS or Class 1 or 2 weeds declared under the LP Act, weed control measures will be implemented. Weed control measures will be based on Queensland Department of Agriculture, Forestry and Fisheries and Isaac Regional Council advice. Declared pests listed under the *Plant Protection Act 1989* will also be monitored as part of the annual monitoring program during construction.	Environmental Manager	During Construction and Operations	Monitoring records and logs
All vehicles, equipment and materials brought onto site will be certified as free of weeds and weed seeds and carry a weed hygiene declaration. Records are to be kept of compliance with this requirement. Adani will install a weed wash down facility onsite.	Plant Manager / Contractors	During Construction and Operations	Records Wash down facility
Soil stripped and stockpiled from areas containing known declared pests listed under the *Plant Protection Act 1989* and weed infestations will be stored separately and are not to be moved to areas free of weeds and declared pests.	Site Manager	During Construction and Operations	Soil management plans and records
Construction staff will not bring domestic animals to the Project Area.	Site Manager	During Construction and Operations	No domestic animals
Monitoring of feral species populations in the Project Area and implementation of a control program if necessary.	Environmental Manager	During Construction and Operations	Monitoring records and logs Control Program

15. Scenic Amenity

15.1 Legislative Framework

While the EP Act includes aesthetic dimensions in its definition of environment, there are no specific provisions in relation to scenic amenity.

Scenic amenity is often a consideration under regional and local planning provisions and there may be provisions under the Development Scheme for the State Development Area.

15.2 Environmental Values

The landscape in the vicinity of the offsite infrastructure area is flat to slightly undulating modified bushland. The dominant land use is grazing which takes place on a mosaic of pasture and remnant vegetation.

Viewers travelling along Moray-Carmichael Road will be able to see the offsite infrastructure otherwise, it is not expected to be visible from homesteads in the area.

15.3 Potential Impacts

Table 15-1 Potential Environmental Impacts

Activity	Potential Environmental Impact
Vegetation clearing	Increased visual permeability. Change in landscape from native vegetation to cleared land.
Offsite infrastructure and facilities	Increase in presence of built infrastructure in the landscape.
Lighting	Appearance of a glow around buildings and infrastructure at night.

15.4 Performance Outcome

Minimal change to visual amenity from residential viewpoints.

15.5 Proposed Controls

15.5.1 Design, Procurement and Pre-construction

Table 15-2 Visual Amenity – Design, Procurement and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Design lighting systems to minimise light spillage and upward “glow”.	Design Manager	During detailed design	Design checklist

15.5.2 Construction and Operation

Table 15-3 Visual Amenity – Construction and Operational Controls

Control	Responsibility	Timing	Evidence
Maintain all offsite infrastructure areas in a neat and tidy condition.	NA		Site checks
Retain vegetation along Moray-Carmichael Road.	Construction Manager, Area Manager	During construction and operation	Vegetation screening

15.6 Monitoring and Corrective Action

There are no monitoring requirements in relation to visual amenity.

16. Erosion and Sediment Control

16.1 Legislative Framework

While there are no formal legislative requirements in relation to erosion and sediment control, the EP Act specifically makes it an offence to deposit contaminants into surface waters, and to place contaminants in such a way as the contaminant may be reasonably expected to enter surface waters.

Development approval conditions for the offsite infrastructure may also contain requirements in relation to erosion and sediment control.

16.2 Environmental Values

Environmental values relevant to erosion and sediment control include soil resources, particularly topsoil resources which are a scarce resource within the project area. Erosion and sediment mobilisation due to the lack of, or the inadequate design, implementation and management of approved erosion and sediment controls (ESC) has potential to impact on a surface water quality (Section 9.2) and aquatic ecosystem values (Section 13.2).

In the absence of soil survey data, soils occurring within the offsite facilities are likley to be similar to the soils described for the Mine (Mine EIS Volume 4 Appendix L Mine Soils Assessment). The majority of the soils defined within EPC 1690, have poorly structured topsoils which contain high proportions of fine sand, relative to silt and clay. These poorly structured surface soils have the potential to form bull dust when disturbed and are highly susceptible to both wind and water erosion if not adequately managed and protected. These sandy profiles are general acidic and infertile with a low water holding capacity, while areas of shallow rocky soils (Rudosols), occurring on crests and hill slopes have shallow effective rooting depths.

Many of the duplex soil types, have sodic subsoils, which will are dispersive if exposed and susceptible to tunnel and gully erosion

16.3 Potential Impacts

Vegetation clearing, earthworks and stockpiling of topsoil and overburden during both construction and operation will result in exposure of soils to erosive forces from either overland flows of water or wind action.

The initial impact of erosion is loss of topsoil resources, which may compromise rehabilitation success.

Sediment mobilised by overland flow will be carried to drainage lines and watercourses. Impacts include:

- Increased turbidity, affecting light penetration and photosynthesis processes in aquatic environments
- Direct smothering of aquatic ecosystems by deposition of sediment
- Where large quantities of sediment are transported to watercourses, geomorphological changes may occur. For example, sediment deposition may obstruct flow causing exacerbation of flooding and alteration of channel pathways.

- The quality of water available to downstream users may be degraded, particularly in relation to appearance and palatability. Pumps and pipes used to extract water from watercourses may become blocked by sediment build up.

All soils will be susceptible to erosion with the removal of vegetation. Soils susceptible to wind erosion include the soils with the sandy or loamy topsoils. Duplex soils with sodic subsoils will be susceptible to dispersion if exposed. Alkaline and sodic soils are generally dispersive, and have high erosion potential if exposed. Sodic, alkaline soils are also poor plant growth mediums due to low nutrient availability, and should not be used as such in rehabilitation of disturbed areas. Exposure of the soil surface to raindrop impact, resulting in surface capping, decreasing infiltration.

Not that impacts relating to wind erosion (dust generation) are covered in Section 6.

Works in watercourses will also result in erosion of the bed and banks if undertaken in flow conditions or if disturbed areas are not stabilised before flows occur. Management of the impacts of works in watercourses is covered in Section 13.

Poor topsoil management can lead to incorrect depths of stripping occurring, allowing for the mixing and stockpiling of topsoil and unsuitable subsoil material. Incorrectly stockpiled topsoil can lead to compaction and structural breakdown, together with poor aeration, which causes biological degradation, limiting the viability of the material for rehabilitation

Continued use of unsealed access tracks by heavy vehicles has the potential to pulverise the soil and produce bulldust, this is particularly relevant in soils with a moderate to high proportions of fine sand and silt.

16.4 Performance Outcome

Sediment releases from the offsite infrastructure area will not cause degradation of aquatic ecosystem and water supply values downstream. Generally, this will be indicated by less than 10 per cent increase in turbidity levels from upstream to downstream of activity areas.

Topsoil resources will not be lost through erosion. This will be measured by visual observation of disturbed areas.

A number of complimentary management plans will be prepared prior to commencement of any construction activities at offsite facilities which will also include performance outcomes in regards to erosion and sediment control. These include:

- Rehabilitation Management Plan
- Topsoil Management Plan

16.5 Proposed Controls

16.5.1 Design and Pre-construction

Table 16-1 Erosion and Sediment Control – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Erosion and Sediment Control Plan (ESCP) must be prepared in accordance with the *Best Practice Erosion and Sediment Control Manual* (IECA, 2008) and implemented for the Project area prior to the commencement of mining operations;	Design Manager	Prior to commencement of construction	Offsite facility Erosion and Sediment Control Plan
Design stormwater systems for infrastructure areas to include sediment retention basins capable of retaining a 1 in 20 year ARI event (or other event as determined through risk assessment in design phase).	Design Manager	Prior to commencement of construction.	Design checklist Stormwater system designs
Locate infrastructure and facilities away from drainage lines and steep slopes wherever practicable.	Design Manager	Prior to commencement of construction	Design checklist
Schedule construction works as far as practical such that: • Works in streams do not need to take place in times of flow • Major vegetation clearing and earthworks activities do not take place in the wet conditions • Permanent stormwater systems are installed as early as possible in the construction phase. • Progressively strip vegetation if possible and only clear what is absolutely necessary.	Construction Manager	Prior to commencement of construction	Construction Schedule
Design access roads and tracks with drainage systems to minimise	Design Manager	Prior to constructing	Design checklist

Control	Responsibility	Timing	Evidence
concentration of flow and erosion risk.		roads	

16.5.2 Construction

Table 16-2 Erosion and Sediment Control – Construction Controls

Control	Responsibility	Timing	Evidence
Develop and implement a customised erosion and sediment control plan for each work area, including linear infrastructure. General principles for erosion and sediment control will be drawn from industry guidelines in place at the time of construction (current preferred guidelines are the International Erosion Control Association (Australasia) Best Practice Erosion and Sediment Control (2008)).	Construction Manager	Prior to any ground disturbance	Erosion controls in place
Strip topsoil as per topsoil management plan (Section 18)	Construction Manager	When commencing construction	Topsoil register
Adequately cover stockpiles of light sandy soils, cover with geo-fabric or spray with polymers to restrict wind and water erosion from stockpiles. Stockpiles of saline and sodic subsoils must be bunded to reduce run on and runoff and prevent the migration sediment and salts from stockpiles . Apply ameliorants to stockpiles of dispersive soils to improve soil structure and reduce runoff. Protect with mulch or vegetation.	Construction Manager	As required	Visual inspections
For areas no longer required after construction, and for buried infrastructure alignments, reinstate areas by:	Construction Manager	As soon as possible after completion of	Rehabilitation register

Control	Responsibility	Timing	Evidence
• Reforming of surfaces to reinstate drainage patterns and prevent scouring or ponding • Replacement of topsoil and revegetation with selected native plant species. Trees and large shrubs are not to be placed over buried infrastructure. Erosion and sediment controls to remain in place until the area is stable and no longer a source of sediment. For areas stabilised by revegetation, a 70% ground cover is required.		construction	
Dust Control Poorly structured topsoils which contain high proportions of fine sand, relative to silt and clay have potential to form bull dust when disturbed and are highly susceptible to both wind and water erosion if not adequately managed and protected. Mitigate for dust by: • Reduce exposure of disturbed areas to the minimum period required and install protective measures (placement of geo-fabric or similar) or undertake revegetation, rehabilitation as soon as practicable after the completion of construction • Upgrading the access track with gravel will help reduce the potential for bulldust to develop Regular spraying of tracks using water trucks for dust suppression	Construction Manager and Environmental Manager	As required	Visual inspection
Compaction – decreasing infiltration, increasing surface runoff: • Restrict vehicle and plant movements to designated roads and active earthworks locations • Cleary define and mark no-go areas • Implement stripping of surface soils to mitigate impacts of compaction	Environmental Manager	As required	Visual inspections

Control	Responsibility	Timing	Evidence
Restrict vehicle movement on wet soil.			
Sodic soils: • Surface stabilisation in areas of mapped sodic soils to achieve stable landform throughout the duration of disturbance • Minimise the amount of vegetation removal • Re-establish vegetation as soon as practically possible following disturbance Ameliorate sodic soils with soil conditioners such as gypsum to improve soil structure if required	Environmental Manager	As required	Visual inspections
Additional ESC controls: • Design of all drainage around proposed structures and permanent landforms should consider the presence of erodible and dispersive soils and apply suitable erosion reduction methods; • Minimise the area to be disturbed; • Minimising the period that the bare soil is left exposed to erosion by rapidly establishing complete grass covers or using other recommended protection measures e.g. geo-fabric linings or mulching (particularly important on sandy soils) • All disturbed areas should be revegetated, or protected from erosion using suitable erosion control measures; • Limiting the area disturbed, and clearing progressively, immediately prior to construction activities commencing if possible • Planning all activities with knowledge of soil types and soil characteristics • Scheduling major earthworks activities to avoid, where possible, the higher rainfall months of December to March; • Safeguarding the surface layer by stripping and stockpiling topsoil prior to construction;	Construction Manager	Prior to any ground disturbance , when commencing construction and as soon as possible after completion of construction	Erosion controls in place and rehabilitation register

Control	Responsibility	Timing	Evidence
• Controlling runoff and sediment loss from disturbed areas using appropriate short term erosion control measures such as silt fences, coir logs, diversion mounds, etc.; • Using temporary soil diversion mounds to control runoff within and to divert water away from construction sites where practicable; • Minimising the period that the bare soil is left exposed to erosion by rapidly establishing complete grass covers or using other recommended protection measures e.g. geo-fabric linings; and Using sediment traps to minimise off-site effects of erosion			

16.5.3 Operations

There are no specific operational controls in relation to erosion and sediment control. If ground disturbing activities are required, the controls for the construction phase should be followed.

16.6 Monitoring and Corrective Action

Table 16-3 Erosion and Sediment Control – Monitoring and Corrective Action

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Inspect erosion and sediment control devices	Environmental Manager	Weekly (Checklist)	See weekly checklist	Undertake repairs or replace devices. Empty sediment from sediment traps. Repair scouring or other eroded areas.
Check capacity of sediment retention basins for overburden stockpiles and stormwater systems	Area Manager	At the end of each wet season	Design capacity is retained	Excavate deposited sediment and dispose of to in-pit disposal area.
Inspect stormwater systems, including diversion drains and outlets	Environmental Manager	Monthly during wet season	No visible signs of scouring, concentration of flow or bypass flows	Repair scouring. Maintain, repair or upgrade stormwater system to prevent scouring, concentration of flows over high risk areas or bypass flows.

17. Contaminated Land

17.1 Legislative Framework

The legislative requirements covering contaminated land in Queensland are primarily contained in the EP Act and subordinate legislation. The EP Act is administered by DEHP.

Prior to commencement of offsite infrastructure activities, none of the affected land parcels were listed on the environmental management register (EMR) or contaminated land register (CLR). As activities proposed at the offsite infrastructure are notifiable activities, all land parcels on which these activities take place will be listed on the EMR.

The EP Act contains a number of provisions in relation to the investigation, management and remediation of contaminated land. If notices are received from DEHP in regard to contaminated land, these notices must be complied with.

In Queensland, acceptable and unacceptable contaminant levels are set in:

- National Environment Protection (Assessment of Site Contamination) Measure 1999
- Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland 1998.

It is an offence under the EP Act to remove soils from a site listed on the CLR or EMR without a permit.

17.2 Environmental Values

Contamination of soil affects the viability of the soil resource. Disturbance of contaminated soil, or contamination of soil also has potential to impact on a surface water quality, groundwater resources and aquatic ecosystem values.

17.3 Potential Impacts

The potential impacts of land contamination may arise in two ways. First, construction and operation activities may increase human exposure to pre-existing contaminants, or mobilise contaminants to surface water or groundwater. Second, construction and operation activities may release contaminants into soils, causing soil contamination.

Soil contamination then has a number of flow on effects, including:

- Acute or chronic toxicity effects on humans and animals who come into contact with the soil, including where contaminated soil becomes wind blown. Contaminated soil guidelines generally focus on whether or not levels of particular contaminants might be high enough to cause toxic effects.
- Inhibition of plant growth, and death of existing plants in contaminated areas
- Mobilisation of contaminants by overland flows to surface watercourses. This in turn may lead to acute or chronic toxicity effects to aquatic organisms and to contamination of water supplies.
- Contaminants in watercourses may be deposited in sediment on the bed of the watercourse, resulting in sediment contamination. Subsequent flow events may re-mobilise sediments into the water columns, and contaminated sediments may also inhibit aquatic plant growth.

- Mobilisation of contaminants to groundwater, which in turn may lead to contamination of groundwater supplies. In high permeability aquifers, contaminant plumes may be conveyed over considerable distances.

17.4 Performance Outcome

Land contamination does not cause inhibition of plant growth, degradation of water resources or toxic effects to humans or other animals. Relevant contaminated land guidelines in place at the time will be used to indicate whether contaminant levels are acceptable.

17.5 Proposed Controls

17.5.1 Design and pre-construction

Table 17-1 Contaminated Land – Design and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Notify DEHP of the location of all notifiable activities.	Environmental Manager	On issue of development approval (environmentally relevant activities)	Correspondence
Design all fuel storages to meet the requirements of AS1940: storage and handling of flammable and combustible liquids.	Design Manager	Prior to construction	Design checklist
All fuel storage to be above ground.	Design Manager	Prior to construction	Design checklist
For all workshop areas, provide: • Secure storage for oils and waste oils with roof and containment bunding equal to 110 % of the largest container • An impervious floor (concrete or similar) in all areas where vehicle maintenance will routinely be carried out • Preferable roofed areas for vehicle maintenance • Containment bunding, including rollover bunds or drains such that spills and rainwater are contained within the designated area • Drainage of maintenance areas to sumps with oil/water separation • Return of treated stormwater and wastewater from maintenance areas for reuse in vehicle washing.	Design Manager	Prior to construction	Design checklist

Control	Responsibility	Timing	Evidence
For refuelling areas, provide: • An impervious floor (concrete or similar) • Containment bunding, including rollover bunds such that spills and rainwater are contained within the designated area • Drainage of refuelling areas to sumps with oil/water separation • Return of treated stormwater and wastewater from refuelling areas for vehicle washing.	Design Manager	Prior to construction	Design checklist
Design vehicle washdown areas so that all runoff water is captured and passed through oil water separators and sediment catchment devices.	Design Manager	Prior to construction	Design checklist
Include a provision in contracts that makes all contractors responsible for and liable for costs of clean up of any contamination arising from activities undertaken by the contractor.	Procurement Manager	Prior to issuing any contract	Contract

17.5.2 Construction and Operation

Table 17-2 Contaminated Land – Construction and Operation Controls

Control	Responsibility	Timing	Evidence
Manage oily waste and hydrocarbon contaminated waste, including waste from sumps and bunds, in accordance with requirements in the waste management sub plan.	Area Manager	Ongoing	Site checklist
Water from vehicle wash areas to be recirculated for use.	Area Manager	Ongoing	Site checklist
Diesel storage tanks and bunds are regularly inspected and maintained.	Area Manager	As per AS 1940 and/or manufacturer's instructions	Maintenance records

Control	Responsibility	Timing	Evidence
Transport of diesel and other dangerous goods to be in accordance with Australian Code for Transport of Dangerous Goods by Road and Rail.	Logistics Manager	Ongoing	Transport records
Refuelling is only to take place at designated refuelling areas.	Area Managers	Ongoing	Observations of mobile refuelling activities
Refuelling activities to be supervised at all times.	Area Managers	Ongoing	Observations of mobile refuelling activities
Workshop, refuelling and other areas are not to be cleaned by hosing of water.	Area Managers	Ongoing	Weekly checklist
Spill kits to be in place at workshops, refuelling areas and other areas where fuels and oils are handled or stored.	Logistics Manager	Ongoing	Weekly checklists
In the event of a spill, ensure all response, management and reporting procedures are implemented.	All staff	Ongoing	Incident register and reports
Conduct risk assessment for incidents of contamination and determine appropriate mitigation and management strategies. Hierarchy of management approaches, from most to least preferred: • On-site treatment of the chemical substances to reduce risk to an acceptable level • Offsite treatment of excavated soil to reduce risk to an acceptable level, after which the treated soil is returned to the site • Containment of soil on site with a properly designed barrier • Disposal of affected soil to an approved landfill. Document in contaminated land register and incident report.	Environmental Manager	As required	Contaminated land register, incident reports

Control	Responsibility	Timing	Evidence
Undertake further testing as required to delineate extent of contamination and/or validate that adequate clean up has occurred. Enter results in contaminated land register and incident report.	Environmental Manager	As required	Contaminated land register, incident reports
If it appears likely that groundwater contamination may have occurred, initiate groundwater testing.	Environmental Manager	As required	Contaminated land register, incident reports
Enter locations of all spills of diesel, oil or other hazardous substances into a contaminated land register. Include details of the type and quantity of contaminant, and testing and remediation actions undertaken. Provide a reference to the incident investigation report.	Environmental Manager	As required	Contaminated land register

17.6 Monitoring and Corrective Action

Table 17-3 Contaminated Land – Monitoring and Corrective Action

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Soil and groundwater testing as required to follow up a particular incident of contamination.	Environmental Manager	As required	Soil and groundwater contamination levels are within current guidelines	Further remediation as required until guideline levels are met.
See also weekly checklist	Environmental Manager	Weekly After rain events	As per checklist	As required to achieve performance requirements in checklists.

18. Soil Resources

18.1 Legislative Framework

The requirement to manage topsoil arises from:

- Legislative requirements in relation to rehabilitation
- State government policy SPP1/92 regarding maintenance of good quality agricultural land resources.

Note that there is no strategic cropping land within the offsite infrastructure area.

Under the *Forestry Act 1959*, the state may recover forestry resources and quarry material from State land prior to disturbance.

18.2 Environmental Values

Soil types present within EPC 1690, shown in EIS Volume 4 Appendix L Mine Soils Assessment are likely to be similar to the soil types occurring within the offsite area. A key limitation for the majority of the soils is the variable depth to underlying hard sandstone or manganese pan. The majority of the soils also have poorly structured topsoils which contain high proportions of fine sand, relative to silt and clay. These poorly structured surface soils are low in organic matter and clay content, and are highly susceptible to both wind and water erosion if not adequately managed and protected. These sandy profiles are general acidic and infertile with a low water holding capacity, while areas of shallow rocky soils (Rudosols), occurring on the crests and hill slopes have shallow effective rooting depths

Depth to saline or sodic subsoil, will also limit depth of stripping on some soils. Further soil testing should be carried out prior to stripping to confirm stripping depths and other soil properties.

Soils in the offsite infrastructure area are suitable for grazing but not for production of export quality cattle, or for cropping.

All soils have high fine sand contents throughout the recommended maximum depth for reuse. Any salvaged material is likely to be subject to slaking, sealing and have poor physical properties due to this very high fine sand content.

18.3 Potential Impacts

Table 18-1 Potential Environmental Impacts – Construction and Operation

Activity	Potential Environmental Impact
Vegetation clearing	Exposure of soils to erosive forces, resulting in loss of soil due to increased surface runoff. All soils will be susceptible to erosion with the removal of vegetation. Soils susceptible to wind erosion include the soils with the sandy or loamy topsoils. Duplex soils with sodic subsoils will be susceptible to dispersion if exposed. Exposure of soils with fine sandy surface horizons to raindrop impact, resulting in surface capping, decreasing profile infiltration

Activity	Potential Environmental Impact
	Reduced viability of topsoil/subsoil to support native plants and pasture due to possible degradation of topsoil structure and loss of organic matter.
	Sedimentation of adjacent water bodies
	Potential increased soil salinity through changes in hydrology
	Reduced agricultural productivity and associated economic impacts

18.4 Performance Outcome

Topsoil and subsoil resources are adequately recovered, stockpiled and biological and physical viability maintained to support the proposed post mining land use.

Minimise soil loss occurring due to mining operations, through implementation of appropriate erosion control practices

Minimise soil compaction..

18.5 Proposed Controls

18.5.1 Design, procurement and pre-construction

Table 18-2 Soils – Designs and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Identify a suitable location or locations for topsoil stockpiling. The area should not be subject to significant overland flow, or flow should be diverted around the area. Risk of accidental disturbance should be minimised.	Environmental Manager / Design Manager	During design	Design plans
Provide details to DNRM regarding proposed footprint relative to State land such that DNRM can determine whether there is a need to salvage quarry material or forest products.	Environmental Manager	Prior to disturbance	Correspondence

18.5.2 Construction and Operations

Table 18-3 Soils – Construction Controls

Control	Responsibility	Timing	Evidence
Survey soils types to confirm stripping depths and other limitations such as sodicity, slaking and alkalinity.	Construction Manager	Prior to vegetation clearing	Survey results
Strip topsoil prior to any earthworks or other surface disturbance. Topsoil stripping depths and other requirements will be set out permit to disturb.	Construction Manager	Prior to any earthworks or disturbance	Permit to disturb
Place topsoil in stockpiles no more than 1.5m in height and with side slope steepness depending on the nature of the topsoil such that stockpiles do not fail. Clearly sign post stockpiles for easy identification	Construction Manager	Immediately on stripping of topsoil	Topsoil register

Control	Responsibility	Timing	Evidence
If stockpiles are to remain in place for more than six months, rip and seed topsoils. Seeding may be with native grass species or a sterile introduced grass species. This should be recorded on the topsoil register, recording: • Soil type • Source location • Date and depth of stripping • Location of stockpile placement • Volume in stockpile • Date of required management actions (turning, seeding, amelioration) • Date, depth and location of replacement	Construction Manager	Immediately after placement in stockpile	Topsoil register
Implement Erosion and Sediment Control measures consistent with the practices described in the International Erosion Control Association (IECA), *Best Practice Erosion and Sediment Control Guideline*, 2008.	Construction Manager	Ongoing	Weekly environmental inspection checklist
Adequately cover stockpiles of light sandy soils, cover with geo-fabric or spray with polymers to restrict wind and water erosion from stockpiles. Stockpiles of saline and sodic subsoils must be bunded to reduce run on and runoff and prevent the migration sediment and salts from stockpiles . Apply ameliorants to stockpiles of dispersive soils to improve soil structure and reduce runoff. Protect with mulch or vegetation.	Construction Manager	As required	Visual inspections

Control	Responsibility	Timing	Evidence
Dust creation • Minimise time of disturbance period required and install protective measures or undertake revegetation, rehabilitation as soon as practicably possible; • Schedule construction activities • Minimise and plan vehicle movement to only what is necessary • Seal tracks and roads if possible with, crushed stone, or small problem areas with geo-fabric; • Cover gently sloping areas with mulch Regular spraying of unsealed or temporary tracks using water trucks for dust suppression.	Construction Manager	As required	Visual inspections
Stockpiled topsoils may be used for rehabilitation trials or for offset areas.	Environmental Manager	As required	Rehabilitation records
Replace topsoil in any disturbed areas that are not required after construction and seed with grass or other species as determined through rehabilitation trials.	Construction Manager	As required	Rehabilitation records
Reinstating all temporarily disturbed areas progressively during and after construction. Reinstatement will be as close as possible to pre-construction conditions. If soils have been impacted or are naturally low in fertility, amelioration with suitable fertiliser or other ameliorants, such as lime to restore soils to pre-construction productivity or improve productivity for successful rehabilitation. Addition of fertilisers and ameliorants to take place at the same time as topsoil re-placement. Placed saline or sodic subsoil material, must be capped with a layer of	Environmental Manager / Construction Manager	Ongoing	Weekly environmental inspection checklist

Control	Responsibility	Timing	Evidence
benign subsoil material or suitable topsoil of an appropriate depth.			

18.6 Monitoring and Corrective Action

Table 18-4 Soils – Monitoring and Corrective Action

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
Visual inspection of topsoil stockpile areas.	Environmental manager	In high wind conditions	Minimal dust lift off	Rectify existing and re-design/re-apply control measures if necessary Apply water Seed stockpiles if necessary
Visual inspection of topsoil stockpile areas.	Environmental manager	Monthly and after rainfall (>10 mm)	Stockpiles are intact and not slumping Management requirements in topsoil register have been implemented Stockpiles greater than six months to be seeded Vegetation cover is healthy (where required) No sign of erosion	Reshape stockpiles Apply seed to stockpiles Apply water
Visual inspection for erosion and signs of sediment mobilisation off site	Environmental Manager	Monthly and after rainfall (>10mm)	Sediment loads and dirty water runoff from construction a site is being adequately captured and attenuated by control measures as designed	Correct, fix and re-design ESC measures if required
Visual inspection of progressively rehabilitated areas	Environmental Manager	Weekly	Erosion and sediment controls are functioning as designed, no visible signs of soil loss form rehabilitated areas Planted vegetation is successfully established and	Correct, fix and re-design ESC measures if required Re-apply fertiliser

Monitoring action	Responsibility	Frequency	Performance Requirement	Corrective Action
			providing the required level of cover as outline within the Rehabilitation Management Plan	and other ameliorants and re-seed areas of poor germination. Hydro mulch on steeper slopes Irrigate re-seeded areas if necessary

19. Aboriginal Cultural Heritage

19.1 Legislative Framework

Protection of Aboriginal cultural heritage is largely achieved through the *Aboriginal Cultural Heritage Act 2003* which establishes a duty of care in relation to managing impacts on items and places of Aboriginal cultural heritage significance. For the Project, the duty of care will be discharged through the preparation and implementation of cultural heritage management plans, which are to be agreed by Adani and the relevant Aboriginal parties.

There are no Aboriginal cultural heritage places or items within the offsite infrastructure area that are listed under either Federal or Queensland heritage protection legislation (Commonwealth *Aboriginal and Torres Strait Island Heritage Protection Act 1984*, *Environment Protection and Biodiversity Conservation Act 1999*, *Queensland Heritage Act 1992*).

19.2 Environmental Values

The Project affects one native title/Aboriginal party area, being located within the external boundaries of the Wangan and Jagalingou People registered native title claim (QUD85/04, QC04/6)

Details of places and items of Aboriginal cultural heritage significance will not be disclosed in any public documentation. In general, the following Aboriginal cultural heritage values are associated with the mine site and may also be present at the offsite infrastructure area:

- Culturally significant sites within the Project Area should be viewed as connected to the broader landscape outside the Project Area boundary, particularly known ceremonial grounds, rock art, pathways, camp sites, scarred trees and scattered artefacts
- The Carmichael River, Cabbage Tree Creek and a network of creeks and the northern creek system were generally identified as seasonal camping areas and pathways through the broader landscape. Artefact finds are more likely in these areas.
- Artefacts identified include a variety of stone artefacts, scarred trees, grinding grooves. Artefacts were present as discrete items or scatters, with denser scatters associated with potential camping places.

As a complete survey of the offsite infrastructure area has not been undertaken, there is potential for inadvertent discovery of other sites and artefacts.

19.3 Potential Impacts

19.3.1 Construction and Operation

Potential Aboriginal cultural heritage impacts during the construction phase are summarised in Table 19-1 .

Table 19-1 Potential Cultural Heritage Impacts – Construction and Operation

Activity	Potential Cultural Heritage Impact
Vegetation clearing and ground disturbance	Vegetation clearing and ground disturbance will disturb and potentially destroy artefacts. The contextual setting of artefacts will also be effectively destroyed by ground disturbance.
Disturbance and erosion of streams and drainage lines	Erosion may expose artefacts on stream banks and drainage lines, with subsequent loss to downstream environments.

19.4 Performance Outcome

Cultural heritage management plan requirements are met.

19.5 Proposed Controls

19.5.1 Design and pre-construction

Table 19-2 Indigenous Heritage – Design, Procurement and Pre-construction Controls

Control	Responsibility	Timing	Evidence
Cultural heritage management plans will be finalised and approved.	CEO	Pre-Construction	Approved Plans
Any required pre-clearing surveys for construction areas will be undertaken in accordance with the CHMP.	Construction Manager	Pre-Construction	Survey Reports
If significant finds are made, consideration will be given to whether infrastructure footprints can be altered to avoid disturbance.	Construction Manager	Pre-Construction	Design Review
If keeping places are required, these will be established.	Construction Manager	Pre-Construction	Established places as required

19.5.2 Construction

Table 19-3 Indigenous Heritage – Construction Controls

Control	Responsibility	Timing	Evidence
Monitoring of ground disturbing activities at certain locations. Protocols in relation to monitoring, including giving of notice to the relevant Aboriginal parties to provide monitors, the activities of these monitors during monitoring activities and requirements if a cultural heritage find is made are set out in the Cultural Heritage Management Plan (CHMPs).	Construction Manager	Ongoing	Compliance with CHMP
Collection and management of any artefact finds.	Construction Manager	Ongoing	Compliance with CHMP

19.5.3 Operation

Table 19-4 Indigenous Heritage – Operation Controls

Control	Responsibility	Timing	Evidence
Monitoring of ground disturbing activities at certain locations. Protocols in relation to monitoring, including giving of notice to the relevant Aboriginal parties to provide monitors, the activities of these monitors during monitoring activities and requirements if a cultural heritage find is made are set out in the CHMPs.	Mine General Manager	Ongoing	Compliance with CHMP
Collection and management of any artefact finds.	Mine General Manager	Ongoing	Compliance with CHMP

19.6 Monitoring and Corrective Action

Monitoring and corrective action requirements are set out in the CHMPs developed for the Project.

19.7 Proposed Environmental Authority Conditions

Environmental authority conditions are not proposed in relation to Aboriginal cultural heritage.

20. Non-Indigenous Cultural Heritage

20.1 Legislative Framework

Legislation protecting non-Indigenous cultural heritage is as follows:

- The EPBC Act, administered by SEWPaC, protects listed national heritage places
- The *Queensland Heritage Act 1992* (QH Act), administered by the Department of EHP identifies and protects places of state heritage significance. It applies to discovery and protection of any previously unidentified archaeological artefacts or archaeological places.

The Charter for the Conservation of Places of Cultural Significance (The Burra Charter) 1977 is used to define cultural significance in Queensland and derives its philosophical principles from the International Council on Monuments and Sites (ICOMOS).

20.2 Environmental Values

There are no listed non-Indigenous cultural heritage sites present within the offsite infrastructure area. Some items associated with pastoral activities may have limited, localised cultural heritage significance, however no particular values have been identified.

The potential for inadvertent discovery of significant non-Indigenous cultural heritage items is considered low.

20.3 Potential Impacts

Potential impacts related to inadvertent discovery of non-Indigenous cultural heritage items will arise from vegetation clearing and ground disturbance and hence, are similar during both the construction and operation phases. Potential impacts are shown in Table 20-1.

Table 20-1 Potential Cultural Heritage Impacts – Construction and Operation

Activity	Potential Cultural Heritage Impact
Vegetation clearing and ground disturbance	Inadvertent finds of items of actual or potential cultural heritage significance.

20.4 Performance Outcome

Previously unknown sites of non-Indigenous cultural heritage significance are identified and contribution that these sites may make to understanding of pastoral activities and use of the area is recorded.

20.5 Proposed Controls

Table 20-2 Non-Indigenous Cultural Heritage – Construction and Operation Controls

Control	Responsibility	Timing	Evidence
In the event that an inadvertent find of potentially significant cultural heritage material is made cease work and notify the Environmental Officer or Environmental Manager	All staff	Ongoing	Incident register
Determine whether further action is required and archaeological assessment and/or salvage if required	Environmental Manager	If a find is made	Incident register

20.6 Monitoring and Corrective Action

In the event that a significant non-Indigenous cultural heritage place or item is identified, monitoring requirements may need to be developed.

20.7 Proposed Environmental Authority Conditions

Environmental authority conditions are not proposed.

21. Emergency Management and Response

21.1 Emergency Response Plan

An emergency response plan will be developed for the offsite infrastructure as required by Adani's Compliance Guideline CG-015 and will include:

- An identification and risk assessment of potential emergencies and incidents, including those that might cause environmental harm
- Roles and responsibilities in relation to emergency response, reporting and notification
- Up-to-date site location and layout (Adani Compliance Guideline CG-027)
- Emergency phone numbers (internal and external)
- Type, use and location of emergency response equipment, including PPE
- Hazardous materials on site, including location, quantity, types, method of storage, handling, fire-fighting methods to be used and environmental hazards (refer Adani's Compliance Guideline CG-024)
- Procedures for response to all reasonably foreseeable incidents and emergencies
- The arrangements for alert or alarm situation (who should be notified, how, etc.).

Local emergency services will be consulted in preparation of the emergency response plan and the plan will be made available to local emergency services.

Likely emergencies or incidents which may have environmental impacts are shown in Table 21-1 . In relation to environmental incidents and emergencies, requirements for prevention will be included in relevant sub-plans within this EMP.

Table 21-1 Emergencies with Potential Environmental Impact

Incident	Potential Environmental Impact	Prevention	Emergency Response
Spills of environmentally hazardous materials	Contamination of soil Contamination of surface water and groundwater Toxicity to animals and plants Water resources cannot be uses for identified beneficial uses	Design of storages Storage and handling procedures Training Spill containment and clean up equipment in place at risk areas for small, medium and large spills	Contain spill Remove all contaminated materials or remediate contamination in-situ
Bushfire	Loss of native vegetation and habitat Death or injury of native animals Death or injury to humans Air pollution – particulates and greenhouse gas emissions	Management of combustible materials and ignition sources and including vehicle movements across grassed areas and cigarettes. Fuel reduction where necessary and consistent with fire regimes for native vegetation Fire protection and fire fighting equipment Firebreaks Training	Fight fire using trained crews and equipment and with assistance from Queensland emergency services as required Ensure a sufficient water supply is available Ensure roads are accessible at all times Compliance with Adani's Bushfire Management Plan
Flooding	Exposure of soils to erosive forces, resulting in loss of soil resource Loss of sewage during a flood event Loss of hazardous substances during a	Siting rail infrastructure outside of the flood plains. Installation of controls such as levies around infrastructure that is located within flood plains	Compliance with Adani's Emergency Response Standard Determine flood risk

Incident	Potential Environmental Impact	Prevention	Emergency Response
	flood event	Monitor weather warnings	Monitor weather warnings Protect assets (relocate if possible) Secure site Evacuate all construction personnel

21.2 Incident Reporting and Notification

Incident reporting requirements will be set out in the Emergency Response Plan and will include those set out in Table 21-2.

Table 21-2 Incident Reporting and Notification

Type of Incident	Report to	Report by	Timing
All serious incidents	Environmental Manager	First on scene	Immediately
incidents involving actual or potential environmental harm	Environmental Manager and/or Officers	First on scene	Immediately
Incident involving non-compliance with environmental authority	DEHP – pollution hotline DEHP – representative officer	Mine Manager or Environmental Manager Mine Manager or Environmental Manager	Within 24 hours (initial notification) Within 14 business days (full report)
Incident involving non-compliance with another approval	Relevant agency	Mine Manager or Environmental Manager	On becoming aware of the non-compliance
Incidents causing actual or potential serious or material environmental harm[(1)]	DEHP Owner and occupier of affected land All persons at the affected land	Mine Manager or Environmental Manager[(2)]	Within 24 hours of becoming aware

(1) Note Environmental harm is defined in Sections 14-17 of the EP Act http://www.legislation.qld.gov.au/acts_sls/Acts_SL_E.htm

(2) Note that if the mine manager or Environmental manager is not available, the person who first became aware of the potential or actual environmental harm must themselves make a report to EHP and the owners and occupiers of the affected land

21.3 Incident Investigation

Incident investigation requirements are set out in Section 4.4 of Adani's Compliance Guideline CG-006 – Incident Investigation and Reporting.

In relation to environmental incidents, reports to the administering authority of the EP Act must include "the event, its nature and the circumstances in which it happened".

Environmental incident investigations and reports will cover:

- A description of the incident, including witness accounts
- A description of any releases to land, air or water or other environmental harm that may have occurred, including loss of native plants or habitat for native animals
- A description of the environmental values affected or potentially affected.

- Whether releases or other harm caused by the incident was in excess of prescribed standards or requirements (for example, whether particulate emissions exceeded compliance levels, or whether vegetation was cleared outside areas where clearing was authorised)
- Whether a formal non-compliance with legislative requirements or approval conditions occurred
- Whether the incident constituted serious or material environmental harm as defined under the EP Act
- Whether internal procedures or requirements were breached
- Formal and informal reports and notifications made internally and externally
- A review of the causes of the incident or near miss
- Recommendations in relation to actions required to rectify any environmental harm or damage that may have occurred
- Recommendations in relation to preventing a recurrence of the incident or near miss. These may include:
    - Disciplinary action against individual employees
    - Revisions to procedures and work methods
    - Maintenance, repairs or re-design of infrastructure, facilities or equipment.

All recommendations from incident investigations will be included in the corrective action register.

22. Community

22.1 Legislative Framework

A key focus of the EP Act is to protect amenity and beneficial uses of the environment for humans, particularly in relation to noise, air quality, waste management, land contamination and surface and groundwater quality. Management measures to minimise impacts on these values are contained within this EMP. It is a condition of the environmental authority that if complaints are received in relation to any of these issues, these complaints are investigated and responded to.

Adani has developed a social impact management plan (SIMP) which contains a range of measures to mitigate and monitor social impacts of a project on members of the community. Hence, this EMP only addresses impacts on the community in relation to the environmental values protected under the EP Act.

22.2 Performance Outcome

Community amenity and beneficial uses of air, noise and water resources are not degraded.

22.3 Proposed Controls

If complaints or inquiries are received from a member of the community or other external party:

Table 22-1 Preconstruction, Construction and Operation Controls

Control	Responsibility	Timing	Evidence
The complaint or inquiry will be recorded in the Consultation Manager database, including details of the complainant and the nature of the complaint.	Community and Stakeholder Manager	Ongoing	Records and Actions
If an investigation of the complaint is required, this will be undertaken using the incident investigation procedure established under the HSS system.	Community and Stakeholder Manager	Ongoing	Procedure followed as evidenced by incident reports
Any corrective actions identified will be entered into the corrective action register.	Community and Stakeholder Manager	Ongoing	Records and Actions
Any community non-compliances with conditions of the environmental authority will be notified to the administering authority.	Community and Stakeholder Manager	Ongoing	Records and Actions

23. References

Adani Compliance Guidelines

- CG-002 Legal Obligations
- CG-003 Training and Competency
- CG-004 Audits and Assessments
- CG-005 Corrective and Preventative Action
- CG-006 Incident Investigation and Reporting
- CG-011 Management Review
- CG-015 Emergency Preparedness and Response
- CD-019 Demolition and Decommissioning
- CG-021 Procurement
- CG-022 Contractor Management
- CG-024 Hazardous Management and Dangerous Goods
- CG-128 Management Commitment

Adani Management Standards

- ST-03 Training and Competency
- ST-04 Documentation, Document Control and Records
- ST-18 Reviews, Audits and Inspection

USEPA, Region 7 Environmental Management System, http://www.epa.gov/region7/ems/index.htm accessed 24/09/2012