Australia Pacific LNG Project

Volume 3: Gas Pipeline

Chapter 24: Environmental Management Plan

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24 Environmental management plan

24.1 Introduction

24.1.1 Objectives and scope of EMP

This environmental management plan (EM Plan) has been developed from the findings of Volume 3 of the environmental impact statement (EIS) for the construction, operation and decommissioning of the Australia Pacific LNG Project gas pipeline to connect the Walloons gas fields with the LNG facility near Laird Point. It has been developed in accordance with the terms of reference issued for the Project and aims to meet the requirements for environmental managements plans as specified in section 310D of the *Environmental Protection Act 1994 (*EP Act). It has been designed to be read as a stand-alone document and in doing so:

- Summarises the management strategies for the gas pipeline identified in the EIS
- Details the proposed performance criteria and implementation strategies to prevent or minimise environmental impacts
- Provides the government authorities and stakeholders with evidence that the environmental management for the Project is acceptable through demonstrating how Australia Pacific LNG environmental protection commitments will be achieved.

Once in place the EM Plan will be a dynamic document. It will be updated to incorporate:

- Further information
- Changes in environmental management measures further to additional information available from detailed design
- Changes to legislative requirements

24.1.2 EMP format

Three EM Plans have been developed as part of the Australia Pacific LNG Environmental Impact Statement (EIS); gas fields, gas pipeline and LNG facilities. This EM Plan addresses the construction, operation, decommissioning and rehabilitation of the gas pipeline. Management measures have been developed for the following elements:

- Land management
- Terrestrial ecology
- Aquatic ecology
- Marine ecology
- Water resources
- Coastal environment
- Air quality
- Greenhouse gases
- Noise and vibration

- Waste management
- Traffic and transport
- Indigenous cultural heritage
- Non-indigenous cultural heritage
- Social
- Hazard and risk management.

The above elements are addressed in terms of propose performance criteria, implementation strategies, monitoring, auditing, reporting and corrective actions, as detailed in Table 24.1.

Table 24.1 Environmental plan structure

Element/issue	*Aspect of construction or operation to be managed (as it affects environmental values)*
Operational policy	*The operational policy or management objective that applies to the element*
Performance criteria	*Measurable performance criteria (outcomes) for each element of the operation*
Implementation strategy	*The strategies, tasks or action program (to nominated operational design standards) that would be implemented to achieve the performance criteria*
Monitoring	*The monitoring requirements to measure actual performance (i.e. specified limits to pre-selected indicators of change)*
Auditing	*The auditing requirements to demonstrate implementation of agreed construction and operation environmental management strategies and compliance with agreed performance criteria*
Reporting	*Format, timing and responsibility for reporting of auditing and monitoring results*
Corrective action	*The action (options) to be implemented in case a performance requirement is not reached and the person(s) responsible for action (including staff authority and management structure)*

24.2 Project description and petroleum activities

Australia Pacific LNG proposes to develop a world scale long-term CSG to LNG project in Queensland. The 30 year Project has the following objectives:

- Development of the Walloons gas fields in the Surat Basin in southern central Queensland with up to 10,000 CSG wells
- Construction and operation of a 450km main gas transmission pipeline ('the gas pipeline') to connect the Walloons gas fields with the LNG facility near Laird Point
- Construction and operation of an LNG facility near Laird Point on Curtis Island near Gladstone for production and export of approximately 18Mtpa of LNG.

This EM Plan covers the gas pipeline which will be constructed and operated by Origin Energy Limited (Origin) on behalf of Australia Pacific LNG Pty Limited (Australia Pacific LNG). The gas pipeline will span three local government areas, including the Western Downs and Gladstone regional councils and the Banana Shire.

The 36” to 40” gas pipeline system will include:

- A 44km lateral pipeline connecting the Condabri development with the main pipeline
- A 38km lateral pipeline connecting the Woleebee development with the main pipeline
- A 362km main transmission pipeline from the junction with the laterals (above) east of Wandoan to Curtis Island in the north.

. Equipment and components necessary to the operation, maintenance and inspection of the pipelines will be installed at the beginning and end of each of the above sections, and at the mid-point. The equipment and components will be enclosed within secure fencing and include isolation valves, scraper launchers and receivers, and instrumentation for control and monitoring.

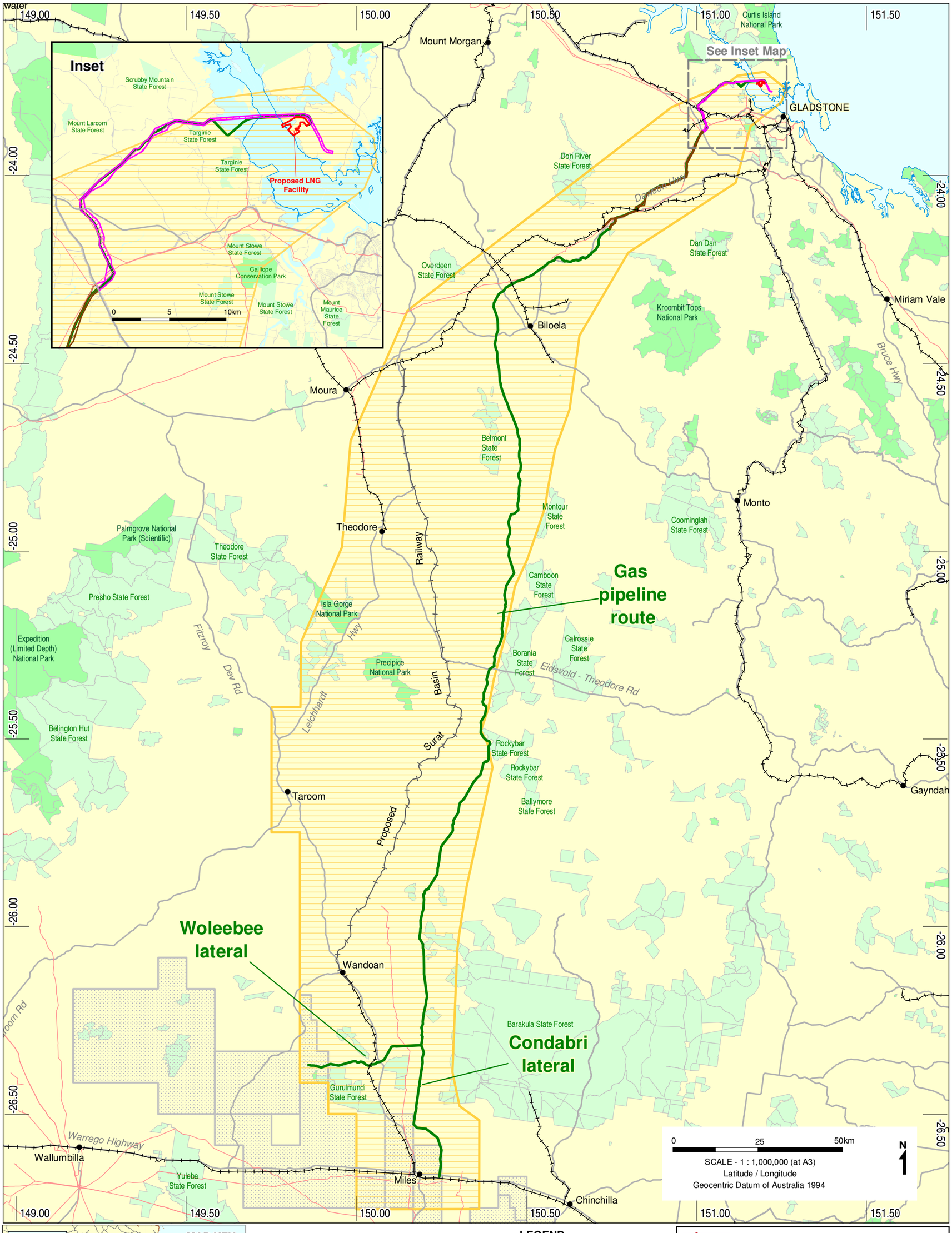
The location of the gas pipeline is shown on Figure 24.1.

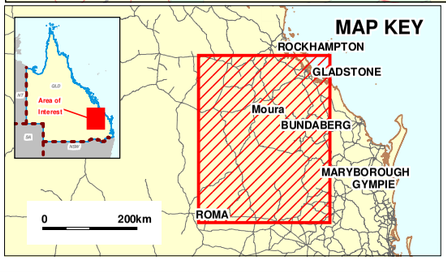
The gas pipeline alignment crosses The Narrows to Curtis Island. The alignment for the pipeline crossing will be determined having regard to the Department of Infrastructure and Planning's proposal for a common gas pipeline corridor across to Curtis Island. Whilst the alignment of this common corridor for the pipeline crossing the wetlands on the mainland and The Narrows is not currently finalised, an indicative route has been provided by the Queensland Government. For the purposes of this EIS, this indicative route has been assessed. The route in part traverses the southern end of the Great Barrier Reef Coast Marine Park as described in Schedule 2 of the *Marine Parks (Declaration) Regulation 2006*. A route that traverses the Marine Park is not Australia Pacific LNG's preferred route. Australia Pacific LNG is working with other industry proponents to define an alternate route which is immediately to the south of, and outside, the Marine Park.

Australia Pacific LNG proposes to utilise horizontal directional drilling (HDD) for this crossing. In the event that HDD is determined not to be feasible, based on final engineering investigations or construction constraints, Australia Pacific LNG would instead use dredging equipment to excavate a trench across the seabed of The Narrows into which the pipeline would be installed.

The gas pipeline system will be constructed, operated, and decommissioned in accordance with Australian Standards AS 2885:2008 - Pipelines—Gas and liquid petroleum.

Discussions are currently underway with other LNG project proponents regarding an alternative combined approach which would involve a joint installation of several pipelines constructed as a bundled single crossing. All pipelines would be installed at one time in a common trench dredged across the Narrows and then backfilled.





SOURCE INFORMATION

Roads
Department of Main Roads 2009
Preferred Gas Pipeline Alignment
Provided by Origin Energy 03/11/2009
Protected Areas
Department of Environment and Resource Management 2009
Callide Common Infrastructure Corridor
supplied by the client 28/10/2009
Gladstone State Development Area Corridor (GSDAC)
Department of Infrastructure and Planning, Queensland 2009

LEGEND

- Road
- Existing pipeline
- Railway
- Gas pipeline route
- Walloons gas fields development area
- APLNG main pipeline study area
- State forest
- National park
- Callide Common Infrastructure Corridor
- Gladstone State Development Area Corridor

AUSTRALIA PACIFIC LNG PROJECT

Volume 3 Chapter 24
Figure 24.1 Gas pipeline location

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24.3 Health, Safety and Environmental Policy and Management System

24.3.1 Introduction

As mentioned in section 24.2, Origin will operate the gas fields for Australia Pacific LNG. Origin operates under an established Health, Safety and Environment Management System (HSEMS) to minimise and manage the impacts on the workforce, the environment and the communities in which the company operates. The HSEMS has been developed with reference to Australian/New Zealand Standard ISO 14001 - Environmental Management Systems. The framework for the HSEMS is based on the continual improvement methodology of Commit-Plan-Do-Check and Review. The elements of the continual improvement loop are executed through a set of company Standards which interpret and support the Health, Safety and Environment (HSE) Policy. The HSE Policy is provided in Figure 24.2

24.3.2 Standards

The objectives of Origin's HSE Management Standards are to:

- Set and formalise expectations for the progressive development and implementation of more specific requirements within Origin Business Units
- Provide auditable criteria against which the HSE Management System can be measured
- Provide a basis from which to drive continual improvement

The twenty HSE Standards define what must be achieved rather than how to achieve it. Therefore Business Units have the flexibility to meet the requirements of the standards while maintaining consistency of approach across the Company.

The system also provides mechanisms for assurance of diligence, so that in the event of a failure, it can be demonstrated that all reasonable and foreseeable steps have been taken to avoid the failure.

Origin's HSE Management Standards are mandatory and form the basis for the development and application of HSE Plans at all levels of the company. The content of the Standards and structure of Origin's HSEMS are described at http://www.originenergy.com.au/1780/HSE-Policy

origin

Policy

Health, Safety & Environment

At Origin Energy, we value the wellbeing of our employees, contractors, customers, the communities in which we operate and the environment. We are committed to responsible management practices that minimise any adverse health, safety or environmental impacts arising from our activities, products or services.

We have in place a Health, Safety and Environmental management system for all our activities that drives continual improvement. The HSE Management System outlines HSE accountabilities to implement this Policy and requires that we:

- Identify and manage risks to as low as reasonably practicable where they have the potential to cause an accident, injury or illness to people, or unacceptable impacts on the environment or the community;
- Provide safe work places and systems of work, empower employees and contractors to address unsafe or hazardous situations and carry out their work in a manner that does not present a risk to themselves, others or the environment;
- Support the recovery and rehabilitation of employees in the event of work related injury or illness;
- Set objectives and targets which promote the efficient use of energy and resources, the minimisation of wastes and emissions and the prevention of pollution;
- Ensure compliance with relevant HSE legal requirements and other commitments;
- Require Contractors to manage HSE using standards and practices that accord with this Policy;
- Regularly review and report HSE performance.

In implementing this Policy we will engage with our employees, contractors, suppliers, business partners, customers and Government and communicate expectations to all persons working with or on behalf of Origin Energy.

Accountabilities

The Board is responsible for establishing and overviewing the Company's commitment to manage HSE in accordance with this Policy and for monitoring the performance of the Company with respect to its implementation.

The Managing Director is responsible for the implementation of the HSE Management System to ensure the commitments made in this Policy are being met.

Grant King

Grant King
Managing Director
September 2007

Review Date: September 2009

Health Safety and Environment
HSE ms
Management System

Figure 24.2 Origin HSE Policy

24.3.3 HSE plans

A requirement of Origin's HSEMS is to prepare a Health, Safety and Environment Plan (HSE Plan). The structure of the HSE Plan is outlined in Figure 24.3. The Management Plan describes how compliance with the HSEMS is achieved and identifies personnel responsible and accountable for its implementation. The Action Plan specifies the activities that must be undertaken to achieve compliance including monitoring, reporting, auditing and timeframes in which the activities must be completed. The outcomes from the Action Plan are fed into the HSE Management Plan to ensure continual improvement is achieved.

The HSE Plan describes how the assessed risks are controlled and provides processes for assessing new risks. It provides processes for corporate and external reporting, close out of audit findings, licence condition compliance, audit and inspection schedules, training and other requirements.

HSE Plans will be developed for all parts of the operations and will focus on the following:

- Continual improvement of petroleum activities and operations and assessment of new technologies
- Training of the workforce on environment and cultural heritage aspects relevant to their roles and responsibilities. Further detail is provided in Section 24.3.5
- Monitoring of key potential impacts based on risk such as surface and groundwater, weeds, erosion and success of rehabilitation with follow up actions conducted when necessary
- Reporting internally to promote continual improvement of HSE systems by routinely collecting and communicating HSE performance information
- Reporting externally to relevant authorities (such as the annual return) and the public in the Sustainability Report
- Rehabilitation of disturbances following construction to as close to previous landuse as practical
- Internal and external environmental auditing of risk, HSE Plan implementation, compliance with environmental authorities, and other key health, safety and environmental aspects. Further detail is provided in Section 24.3.8

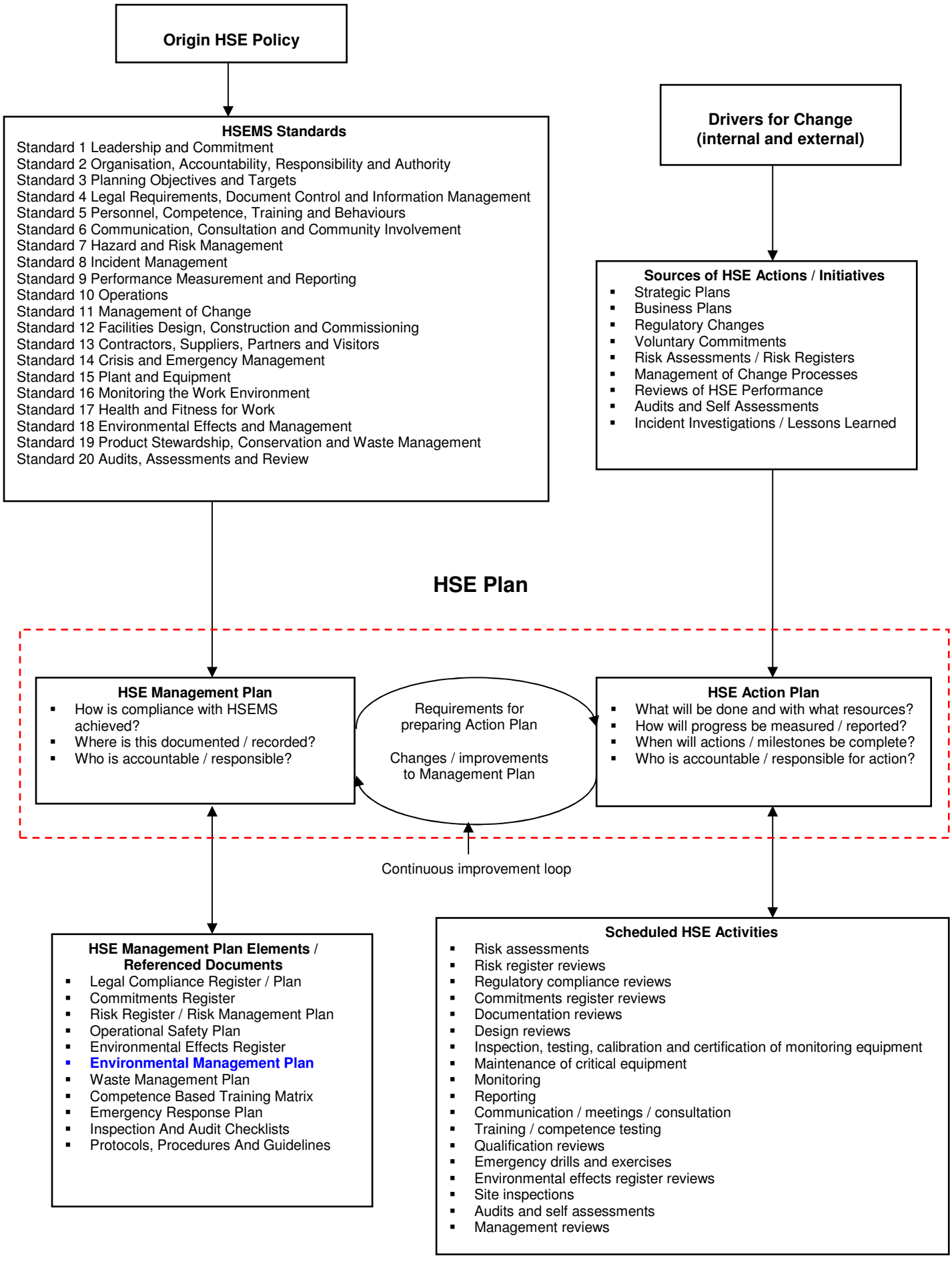

Figure 24.3 HSE Plan structure

24.3.4 Roles and responsibilities

The workforce during the course of their activities are required to adhere to the general environmental duty as specified under Section 319 of the *Environmental Protection Act 1994* "A person must not carry out any activity that causes, or is likely to cause, environmental harm unless the person takes all reasonable and practicable measures to prevent or minimise the harm. Workforce responsibilities include:

- Complying with the requirements of applicable environmental legislation and environmental authorities
- Undertaking all activities in an environmentally responsible manner
- Complying with specific requirements of the development assessment approvals supporting documentation
- Conducting activities in accordance with this EM Plan and HSE Plans
- Participating in environment and cultural heritage training relevant to roles and responsibilities.

Specific roles and responsibilities for this Project are provided in Table 24.2.

Table 24.2 Roles and responsibilities

Role	Responsibilities
Construction/Operations Manager	• Ensure the necessary resources and processes are in place for implementation of the EM Plan • Ensure non-conformances are identified, recorded and reported • Work with the environmental group in planning and implementing environmental requirements • Ensure legal compliance
Site Supervisor	• Ensure the EM Plan requirements are implemented and maintained • Ensure non-conformances are identified, recorded and reported • Drive implementation of corrective actions • Work with the environmental group in planning and implementing environmental requirements
Site Operator	• Carry out the activities in accordance with the EM Plan • Carry out the necessary monitoring and reporting requirements • Identify and report non-conformances • Implement corrective actions • Work with the environmental group in planning and implementing environmental requirements
Environment Group	• Monitor the implementation and effectiveness of the EM Plan • Develop and implement the environmental management manuals/procedures

Role	Responsibilities
	• Review and update the EM Plan • Conduct environmental auditing, monitoring and training • Complete environmental statutory reporting requirements • Provide advice on environmental matters and corrective actions as requested • Review statutory compliance and ensure all approvals in place

Origin has an Environmental Group dedicated to coal seam gas activities. This group identifies the ecological constraints and specifies control measures to protect environmental values and minimise impacts. This group will be responsible for supporting compliance with statutory obligations, environmental commitments and this EM Plan to minimise impacts on the environmental values of the project area.

This group consists of two key components:

- Brisbane based environmental team - focused on long-to-medium term planning including working with engineering divisions to integrate environmental management, monitoring, systems development, auditing, external approvals, system and licence compliance.
- Field based team - focused on medium to short term planning such as compliance monitoring of work zones and subcontractors, internal approvals, assisting the workforce during construction and operations, training and providing advice on field activities.

The teams are structured to allow for growth as the Project develops expands, with specialist consultants supporting a core group of permanent environmental professionals.

24.3.5 Inductions and training

Origin has in place a hierarchy of training modules that dovetail with specific project roles and responsibilities.

The Australia Pacific LNG workforce is required to complete an e-induction prior to commencing work on any worksite. The e-induction introduces the workforce to Origins standards and environmental management requirements. In particular, the induction addresses:

- Environmental responsibilities and duties
- Noise and dust management
- Land disturbance procedures
- Flora and fauna
- Waste
- Weeds
- Landholder relations
- Cultural heritage
- Rehabilitation

A site level induction is also required before commencing work on each particular worksite. The site induction provides more site specific information on environmental issues for that particular area. Formal training in environmental issues such as weed management, vegetation protection and soil management will also be conducted for specific employees or contractors whose roles have the potential to affect these key aspects of the environment.

A kick off meeting is held with all relevant personnel. The kick off meeting includes information on site specific environmental management requirements for that work area which were identified in the internal approval process such as erosion and sediment control, management of flora and fauna values and water management.

Regular tool box meetings are held which include a discussion on environmental aspects, recent incidents and observations and possible improvements in procedures. These meetings reinforce the training and promote greater awareness of specific issues. Site based environmental advisors will regularly interact with the workforce across work areas sharing knowledge and providing feedback on environmental management requirements.

Visitors receive an HSE induction appropriate to the nature of their visit and the site hazards to which they may be exposed.

24.3.6 Monitoring and reporting

Monitoring Program

Origin's existing monitoring program will be adapted to include monitoring required for this Project. The management tables in Section 24.6 to 24.20 identify element-specific monitoring.

Routine visual monitoring will be conducted, where specified in the management tables, and reported by exception only.

All instruments, equipment and measuring devices used for measuring or monitoring will be calibrated, operated and maintained effectively. Laboratory analysis and tests will be carried out by a National Association of Testing Authorities accredited laboratory and monitoring will be conducted by a suitably qualified person.

Monitoring will be conducted to check compliance with environmental authority conditions and identify moderate or higher environmental risks.

Monitoring, management systems and programs detailed in this EM Plan will be reviewed on an annual basis and amended or refined on the basis of auditing and monitoring results.

Monitoring results will be compiled and kept for a minimum of five years

An annual monitoring report will be prepared and provided to the administering authority when requested and will include:

- A summary of 12 months monitoring results and a comparison of the results against the limits set in the environmental authority and relevant previous results
- An evaluation/explanation of the data derived from any monitoring programs
- A summary of any quantities of releases
- An outline of actions taken or proposed to minimise the risk of environmental harm from any condition or contaminant level identified by the monitoring or recording programs.

Incidents

The existing Origin HSE incident reporting system is discussed in Section 24.3.7. Monitoring in response to an incident will be undertaken within a reasonable and practical timeframe to investigate any report of potential environmental harm or licence exceedence. The following spills of contaminants will be reported to the administering authority:

- Release of any volume of contaminants to water
- Release of volumes of contaminants greater than 200L of hydrocarbon or 2,000L of associated water to land
- Release of any volumes of contaminants where potential serious or material environmental harm has occurred or may occur.

The notification of emergencies or incidents will include the following information

- The environmental authority number and name
- The name and telephone number of the designated contact person
- The location of the emergency or incident
- The date and time of the release
- The time the authority holder became aware of the emergency or incident
- The estimated quantity and type of any substances involved in the incident
- The actual or potential suspected cause of the release
- A description of the effects of the incident including any environmental harm that has occurred or may occur as a result of the release
- Any sampling conducted or proposed, relevant to the emergency or incident
- Actions taken to prevent any further release and mitigate any environmental harm caused by the release.

A written report will be provided to the administering authority within 14 days following the initial notification of an emergency or incident or receipt of monitoring results. The report will include:

- Results and interpretation of samples taken at the time of the incident and analysed
- Outcomes of actions taken at the time of the incident to prevent or minimise environmental harm
- Proposed actions to prevent a recurrence of the emergency or incident.

Within six weeks of any environmental monitoring performed in relation to the emergency or incident, a written report on the results of any such monitoring will be provided to the administering authority.

Complaints

Complaints received from external stakeholders will be investigated. The results of the investigation will be communicated back to the complainant within a reasonable timeframe with a record of the complaints and any actions taken recorded in the complaints database.

For complaints received from the administering authority, the results of the investigation (including an analysis and interpretation of any monitoring results) and abatement measures implemented will be

provided to the administering authority within 14 days of completion of the investigation, or receipt of the monitoring results.

If any monitoring conducted to investigate a complaint indicates that emissions exceed the limits specified in the environmental authority or are causing environmental nuisance, then the following will be undertaken:

- Address the complaint including the use of alternative dispute resolution services if required;
- As soon as practicable implement abatement or attenuation measures so that light, dust, particulate or odour emissions from the authorised activities do not result in further environmental nuisance.

The existing Origin complaints database, consistent with Australian Standards ISO 10002:2006 - Customer Satisfaction – Guideline for complaints handling in organisations, will be used to record any complaints. The following will be recorded for received complaints:

- Name, address and contact number for complainant
- Time and date of complaint
- Reasons for the complaint as stated by the complainant
- Investigations undertaken in response to the complaint
- Conclusions formed
- Actions taken to resolve complaint
- Any abatement measures implemented to mitigate the cause of the complaint
- Name and contact details of the person responsible for resolving the complaint.

24.3.7 Incidents and emergencies

The existing HSE incident reporting system will be used for field activities conducted by the workforce. Environmental incidents and observations will be reported using the HSE Alert process. This process helps ensure appropriate attention to the incident or observation for prioritisation of any follow up action. The process also provides for field improvement opportunities and suggestions to minimise the existing or future environmental risk. The reporting system has an incident and action tracking process to facilitate timely and effective close out of any identified actions arising from the incident.

The workforce is encouraged to report incidents and observations to support continual improvement. External environmental incident/spill reporting will be in accordance with current regulatory guidelines and the environmental authority. The process for reporting environmental incidents/spills to the DERM, as described in Section 24.3.6, will be displayed in Project site offices.

Processes, including risk assessment, are in place to identify hazards and potential emergency situations and their impacts. Emergency Response Plans are developed for sites and they document and communicate the actions to be taken including the interaction with Emergency Services. Emergency response equipment is made available where required and maintained in good order. Minimum competence and training requirements are established and drills/simulations are periodically conducted including the involvement of external stakeholders. Plans are updated to incorporate learnings from previous incidents, incident investigations, drills and exercises and audit outcomes.

Incidents include monitoring results that identify environmental harm, a high risk of causing harm, or an exceedence of licence condition limits. Action will include:

- Confirming the exceedence and investigation process
- Taking necessary steps to rectify the situation
- Notifying the administering authority of the issue and taking actions to rectify the situation.

24.3.8 Inspections, reviews and audits

HSE inspections and reviews are scheduled and conducted at appropriate frequencies to assist with evaluating performance and compliance with the HSE management system and the environmental authorities. These reviews address HSE management standard performance requirements and specific items such as commitments made in this EM Plan. The adherence to established schedules, scopes and corrective actions resulting from the inspections/reviews are monitored by Origin Corporate HSE.

Origin's Corporate HSEMS audit is conducted annually and provides an independent assessment against Origin's Corporate HSE standards. Each business unit is audited under this process at least every second year with the results of the audit and action plans monitored by senior management. The initial audit for this Project will be undertaken within a year from commencement of construction. An HSE audit program at a business unit level checks that each aspect of the business is operating under Origin's internal HSEMS and any external legislative requirements including the environmental authorities.

Pre-qualification, selection and retention processes are applied to contractors and suppliers. Major Project Contractors are required to prepare an EM Plan that complies with HSE requirements such as the Project EM Plan and the environmental authority. The Contractor includes a draft EMP with the tender documentation and the final document is negotiated and approved prior to the commencement of work. HSE requirements are written into the contracts and audits of subcontracting companies' compliance is conducted regularly and in response to any incidents.

When third parties are performing services on behalf of Origin at a defined Origin controlled site, their HSE performance is considered to be within the overall Origin HSE performance.

24.3.9 Document control and records management

Systems are in place to ensure that HSE records are established and maintained and are accurate, legible and identifiable. HSE documents have established retention times consistent with legal requirements. Systems are in place to establish which documents are to be controlled with current versions readily available.

A record of complaints, incidents of environmental harm, and actions taken in response to the complaint or incident will be maintained and retained for five years.

24.4 Risk assessments

Risk assessment is a process that evaluates the likelihood (probability and exposure) and consequences (magnitude) of positive and negative environmental effects occurring as a result of exposure to one or more hazards.

Risks associated with developing and operating the Australia Pacific LNG gasfields have been assessed using a well-established approach to identification and evaluation. These assessments have been conducted in accordance with Australian Standards and industry guidelines. This methodology is based on continual improvement and includes the following steps:

- Establish the context
- Identify risks and hazards
- Analyse risks
- Evaluate risks
- Treat risks
- Monitor and review.

Where mitigation measures are required to reduce the risk to a tolerable level, controls have been identified within the management tables in Sections 24.6 to 24.20.

24.5 Financial assurance

The *Environmental Protection Act 1994* requires the holder of an environmental authority to provide a financial assurance in the amount and form required by the DERM. This financial assurance is held as a security to cover the likely costs and expenses associated with rehabilitation of disturbed areas should the environmental authority holder default on their rehabilitation obligations.

During the application stage for the environmental authority, Australia Pacific LNG will calculate the financial assurance for the construction and operation of the gas pipeline. The calculation will be in accordance with the DERM guidelines at the time.

24.6 Land management

24.6.1 Environmental values

Geology

The majority of the geology in the gas pipeline corridor comprise sedimentary rocks, including coal beds overlaid by deposits of river alluvium in the low lying areas and adjacent to waterways. There are also mud flats near the coast close to Gladstone. Granites and other igneous volcanics of the Connors-Auburn Province are associated with the central region of the gas pipeline corridor near the Banana and Auburn Ranges. There are also volcanics associated with the Yarrol Province in the northern segment of the gas pipeline corridor.

Topography and geomorphology

The topography across the study area varies from predominantly flat or gentle undulating plains, to hills and mountains with slopes greater than 50% gradient. The majority of the route however, traverses flat to gently undulating plains and low hills with slopes less than 20% gradient.

The gas pipeline route crosses numerous watercourses many of which have steep banks. Further details on watercourses is provided in Section 24.10.1.

Soils

There are six soils groups within the gas pipeline corridor with predominantly thin to medium topsoil thickness:

1. Skeletal soils (mainly Rudosols)
2. Texture contrast soils (Chromosols/Sodosols and Kurosols)

3. Red/yellow earths (Kandosols/Tenosols)
4. Brown/ grey non-cracking clays (Dermosols)
5. Brown/grey/dark cracking clays (Vertosols)
6. Grey mottled saline cracking clays and sands (Hydrosols), commonly known as acid sulfate soils.

The shallow texture contrast soils are predominantly used for grazing on improved and native pastures while shallow soils with a predominance of stone are used for forestry activities or rough grazing on native pastures.

The cracking and non-cracking clays (particularly of alluvial origin) are the most productive soils in the region and are used for dryland and irrigated cropping and improved pasture. The texture contrast soils, in particular, were identified as commonly having a highly sodic and dispersive subsoil.

Most of the soil types are considered to have a low erosion potential in their natural state.

Good quality agricultural land

Approximately 44% (774ha) of the gas pipeline right of way has been identified as good quality agricultural land (GQAL). Of this total, 100ha is Class A GQAL, the best agricultural land, mainly associated with the deep dark clay soils of the alluvial plains.

Land contamination

The gas pipeline route is generally anticipated to be free from widespread adverse levels of manmade contaminants, but some localised risks may be present due to the historic land uses. Cattle dips and spray races and unauthorised waste dumps and possible waste disposal are considered to be the most likely source of contaminants, given the rural setting and associated activities.

Landscape and visual amenity

The broader regional landscape is characterised by rural hinterland, National Parks and State Forests with the gently undulating rural lands broken by localised forest-covered mountain ranges and valleys providing a variety of visual landscapes. Outside of the State Forests and National Parks, vegetation cover is predominantly remnant woodlands with frequent tree cover along drainage lines and road reserves.

A combination of agricultural cropland and grazing pastures are scattered throughout the region with an overlay of sealed and unsealed rural roads. Gladstone, a regional urban centre, is well known for its strong industrial base. To the west of Gladstone is the hinterland of Banana Shire, with 11 towns in the Callide and Dawson Valleys. The Banana Shire has significant coal mining activity with extensive grazing and farming land. Townships and rural settlements are dispersed throughout the non-urban landscape.

24.6.2 Potential impacts

The potential impacts of construction and operation of the gas pipeline are as follows:

- Sterilisation of resources
- Altered landform
- Destabilisation of soils

- Change in local surface drainage patterns
- Degradation of downstream water quality
- Loss of GQAL
- Changes to stream morphology
- River bank instability
- Disruption to farming operations
- Reduction in topsoil quality
- Subsidence
- Increase in soil erosion including stream bank erosion
- Downstream sedimentation
- Increase in dust generation including bulldust
- Acidic runoff generated from acid sulfate soils
- Land contamination
- Visual intrusions on the landscape

24.6.3 Land management

Table 24.3 Geomorphology, geology, soils and land contamination – construction

Element/issue	Geomorphology, geology, soils and land contamination – construction
Operational policy	To minimise impacts on geology, geomorphology, soils and land during the construction of the pipeline
Performance criteria	No contamination of land from construction activities All pre-existing contaminated sites indentified prior to construction No significant failures of erosion and sediment control measures
Implementation strategy	The operators and owners of potentially affected infrastructure will be consulted. Work will be planned in consultation with affected landholders to limit disruption to the landholder's use of the land for agricultural and other purposes Pre-construction surveillance will be undertaken based on risk by a suitably trained and qualified person to identify potential contamination where practicable Sediment and erosion control measures will be developed and implemented Creek rehabilitation will be consistent with surrounding environment and contours of the channel at the time of construction Waterways and/or drainage lines will be stabilised at point discharges with appropriate engineering controls, such as scour protection and flow velocity limits An Acid Sulfate Soils investigation and an Acid Sulfate Soils management plan will be completed in accordance with the relevant Queensland guidelines

Element/issue	Geomorphology, geology, soils and land contamination – construction
	Weed management will be proactive including working with regional councils to construct weed wash down facilities located in the Banana Shire to support pipeline construction and operations Chemical stores will have secondary containment. Spill kits will be located throughout the construction site and training will be provided to the workforce Chemical, fuel and waste handling procedures will be implemented If excavation works uncover unexpected contamination, work in proximity of the contamination will cease, and an inspection and assessment of contamination levels will be carried out. Remediation measures will then be recommended and implemented before construction continues
Monitoring	Monitoring will be undertaken in accordance with the HSEMS, as summarised in Section 24.3.6 and the requirements of the environmental authority. Bushfire weather forecasting system will be monitored Routine visual monitoring and recording of erosion and sediment control measures and chemical and fuel storage facilities will be undertaken to assess their effectiveness.
Auditing	The effectiveness of land management implementation strategies and monitoring programs will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring results, complaints, incidents/near misses and auditing results will be reported to demonstrate compliance with performance criteria, the environmental authority and the HSEMS as described in Section 24.3.6. Reporting will also identify opportunities for improvement in accordance with the HSEMS The results of the monitoring will be included in the annual return for the administering authority where appropriate.
Corrective action	Corrective actions will be undertaken in the event of a complaint or incident and based on the results of monitoring and auditing. The form of action will be aspect-specific but may include: • Increased frequency of monitoring • Improved bunding or enclosure of storage areas • Rehabilitation of erosion controls • Training and awareness programs. Confirmed and potential contamination of land as a result of an incident will be immediately reported. The following actions may include: • An investigation into the cause(s) of the incident • A qualitative assessment of the incident's extent and severity, and any impacts to environmental values, which may require input by persons that are suitably qualified under Section 381 of the EP Act

Element/issue	Geomorphology, geology, soils and land contamination – construction
	• Notification of the DERM if the incident is significant, as required in Section 371 of the EP Act • A detailed contamination investigation following relevant guidelines existing at the time of the incident The detailed contamination investigation will determine the need for subsequent remediation and validation, or management to retain the environmental values of the affected area

Table 24.4 Landscape and visual amenity – construction and operation

Element/issue	Landscape and visual amenity – construction and operation
Operational policy	To minimise any potential impacts on visual amenity associated with the construction and operation of the gas pipeline
Performance criteria	Minimal complaints from the community during construction and operation regarding landscape or visual amenity
Implementation strategy	Where practicable: • Construction time within the visible areas of sensitive receptors will be minimised • Clearing of forest and woodland cover will be minimised particularly in the vicinity of sensitive receptors • An analysis of the visual catchment of accommodation facilities will be undertaken to establish if there are any sensitive receptors within 800m of the facility. Where required, strategies will be implemented to minimise impacts, in consultation with the land holder. • Disturbed areas will be rehabilitated to be consistent with surrounding areas • Scrub and other cover will be re-established (within operational and safety bounds) where sight lines are important in forest areas to diminish the contrast between the adjoining forest and the easement • Trees will be properly felled and easements cleared to minimise impact on adjoining vegetation. Felled material will be mulched for reuse in easement rehabilitation works • Topsoil will be stored to enable its use in rehabilitation works • Disturbed areas will be rehabilitated to be consistent with surrounding vegetation types Light will be directed away from sensitive and commercial places. In addition to the above general mitigation strategies for pipelines, the following Landscape Character Zones have specific mitigation measures due to their location in relation to sensitive receptors: • Zone 1 – Condabri coal seam gas field to Pipeline Intersection - A visual screen of low trees will be established to avoid views along the pipeline at this location.

Element/issue	Landscape and visual amenity – construction and operation
	• Zone 3 – Pipeline Intersection to Old Chinchilla Road - Steep forest ridges will be rehabilitated • Zone 12 – Dawson Highway (north) to Coal Road - A detailed visual assessment of potential views to the western portion of the pipeline route from adjoining rural lands will be completed. Tall shrubs/small trees will be planted as needed to screen views onto cleared easement and restore roadside landscape amenity • Zone 14 – Sneaker Gully to Curtis Island - Mangrove and other water side vegetation will be retained, where practicable, to prevent views along the pipeline easement. The easement on Curtis Island will be revegetated with scrub and small tree species that will restore values. This rehabilitation program will be undertaken in collaboration with the other operators within the Common Infrastructure Corridor
Monitoring	Visual monitoring for sensitive or commercial place will be undertaken following completion of the infrastructure Monitoring of incidents will occur through the incident database and established HSEMS incident reporting system as described in Section 24.3.6. High risk incidents will be reviewed by senior management
Auditing	The effectiveness of the landscape and visual measures will be assessed during HSEMS and compliance auditing. Audit processes are described in more detail in Section 24.3.8
Reporting	Complaints and incidents will be reported through the HSEMS and incident reporting system as described in Section 24.3.6
Corrective action	High risk incidents will be reviewed by senior management to ensure adequate controls are in place to minimise the chance of reoccurrence If a nuisance complaint regarding light is received and verified through inspection, abatement or attenuation measures will be implemented as soon as practicable so that light emissions from the authorised activities do not result in environmental nuisance.

24.7 Terrestrial Ecology

24.7.1 Environmental values

The proposed alignment traverses the South East Queensland Brigalow Belt South and Brigalow Belt North bioregions with the majority of the alignment (97.4%) located within the Brigalow Belt South bioregion. The alignment intersects nine different subregions across the three bioregions.

The proposed alignment transects the Callide Timber Reserve, Targinie State Forest, the Great Barrier Reef World Heritage Area and two wetland areas listed on the Directory of Important wetlands database, Port Curtis and The Narrows. No other national or conservation park, state forest or timber reserve, nature refuge or Ramsar-listed wetland of international significance is located within the alignment.

Four areas along the proposed alignment were identified as significant ecological areas because of their integrated flora, fauna and habitat values: Callide and Calliope ranges, Port Curtis and The Narrows, Sandstone Belt (Rockybar/Fairyland) and Gurulmundi – Barakula.

Flora

Vegetation along the alignment is dominated by eucalypt woodlands and open forests, cypress pine (*Callitris glaucophylla*), and brigalow-belah forests (*Acacia harpophylla*, *Casuarina cristata*).

The proposed alignment predominantly traverses extensive cleared areas interspersed with patches of regulated regrowth and remnant vegetation including *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed Threatened Ecological Communities (TECs), and endangered, of concern and not of concern regional ecosystems.

A wide range of flora species occur along the proposed alignment including endangered, vulnerable or rare (EVR) species, regionally significant species, species of other conservation significance (including cultural, commercial and recreational significance) and non native flora species. In particular, the large-fruited zamia palm (*Cycas megacarpa*), listed as endangered under the *Nature Conservation Act 1992* was identified in the Calliope Range.

Fauna

Fourteen different broad faunal habitats (plus non-remnant habitat) are transected by the proposed alignment including brigalow/belah remnants, woodlands, watercourses, freshwater wetlands and mangroves. Brigalow/belah remnants and riparian and floodplain eucalypt woodlands were identified within the pipeline corridor as two key fauna habitats, based on their high significance as habitat for significant fauna, faunal biodiversity values, refugia and wildlife corridors.

A total of 711 fauna species were identified from databases, comprising 28 invertebrates, 46 fish, 43 amphibians, 137 reptiles, 362 birds and 95 mammals. During the field assessment, 182 terrestrial fauna species were recorded, comprising five amphibians, 19 reptiles, 124 birds and 34 mammals.

EVR fauna species, regionally significant species and species of other conservation significance have been recorded along the pipeline alignment or could potentially utilise habitats along the pipeline alignment.

Introduced species are also known to occur along the pipeline corridor including feral pigs, goats, European rabbits and cane toads.

24.7.2 Potential impacts

Potential impacts of the proposed pipeline on flora values may include:

- Decrease in total area of remnant and/or regrowth vegetation in the bioregion and subregion
- Fragmentation, disturbance and/or degradation of vegetation communities
- Loss and/or disturbance of coastal wetland areas
- Loss or harm to EVR and regionally significant flora species and populations
- Fragmentation, disturbance and/or degradation of EVR and regionally significant flora habitat areas
- Loss of cultural, economic and recreational values

- Introduction and/or spread of weed species.

Construction of the pipeline is unlikely to result in a significant long-term impact on common fauna, because similar habitats are available in areas adjacent to the proposed alignment and which they would utilise. Nevertheless, some potential fauna impacts remain and these include the following:

- Removal of habitat such as mature vegetation and hollow-bearing trees
- Disturbance to rocky outcrops and therefore shelter for reptiles and small mammals
- Disturbance to fauna movement corridors and dry season fauna refuges (predominantly associated with creeks)
- Unearthing burrowing fauna species during construction
- Trenchfall - the potential for fauna to fall into and become trapped in the open pipeline trench during construction.

24.7.3 Terrestrial ecology management

Table 24.5 Terrestrial ecology – construction

Element/issue	Terrestrial ecology – construction
Operational policy	To construct the gas fields in a manner that minimises impacts to the abundance and distribution of terrestrial fauna and flora To minimise vegetation clearing to the minimum practicable extent along the right-of-way
Performance criteria	Minimal risk of injury, harm, or entrapment of fauna or livestock No unauthorised clearing of native vegetation No unauthorised disturbance of EVR flora and the habitat of EVR fauna Implementation of vegetation management offsets strategy No uncontrolled outbreaks of declared weeds as a result of the Project No introduction of pest species as a result of Project construction activities
Implementation strategy	***Vegetation*** The clear and grade right-of-way, 40m in width at most locations, will be reduced to the minimum required for safe construction in areas identified as significant vegetation communities or habitat areas The disturbance footprint will be the minimum width required to safely construct the pipeline through sections of brigalow/belah habitat. Existing tracks and cleared areas will be utilised wherever possible Following construction, cleared vegetation will be respread over the easement to provide habitat for ground-dwelling reptile species. Where practicable, minor realignment will be applied to minimise the clearing footprint or avoid the habitat altogether. Supporting infrastructure, such as construction machinery, site offices and worker facilities, will be located on areas that are already cleared or open areas with little understorey

Element/issue	Terrestrial ecology – construction

Clearing of native vegetation in and adjacent to watercourses will be restricted to the construction footprint and any diverted hydrological flows will be reinstated post construction

Construction activities within and near watercourses will be restricted to dry weather conditions where practicable

All construction personnel will be restricted to within the right of way and designated access tracks. Construction personnel will be adequately informed as to which tracks are to be used

Vehicle parking will be restricted to the pipeline construction area and other designated areas

If the endangered large-fruited zamia palm cannot be avoided in the proposed ROW under the Calliope Range (KPs 281.5-282.1), HDD will be investigated as a method to minimise impacts, if practicable

Pre-clearing surveys to identify the presence of EVR and other significant flora species will be undertaken where they are likely to occur. Where populations are identified, the pipeline route will be realigned or the right of way narrowed for short distances where safe, so as to avoid damage or loss of these populations

Where avoidance is not possible, relevant permits and disturbance conditions, which may require a translocation plan, will be obtained where EVR flora species populations are to be cleared

An awareness presentation and/or an identification handbook for the likely identified conservation significant species will be supplied to the construction crews to highlight the importance of the EVR species and avoid accidental impacts

Revegetation / reseeding efforts will be based on soil types, existing location vegetation characteristics and endemism of selected species.

Where rehabilitation includes native vegetation and the area is not naturally regenerating, local indigenous species will be sourced preferably from a local seed bank.

Offsets

A vegetation offsets program will be developed in consultation with the Queensland DERM and the Commonwealth Department of Environment, Water, Heritage and Resources

Fauna

A pre-clearance inspection will be conducted prior to construction to identify potential important nesting or roosting sites for bird and bat species (such as hollow trees, raptor nests). If present, clearing will be timed to avoid seasons where nesting and reproduction are concentrated, where possible

The length of open trench at any one time will be the minimum practicable.

Qualified fauna spotters and handlers will be employed to survey the entire open

Element/issue	Terrestrial ecology – construction

trench daily (preferably in the morning) and remove any trapped fauna species.

Consideration will be given to the use of temporary fencing to exclude access to the trench by livestock and larger native wildlife

A qualified veterinarian from the local area will be utilised to assess and treat or euthanase (as necessary) any large native vertebrates or livestock

Appropriate measures will be applied to ensure vehicles remain on designated access roads and tracks and within defined pipeline construction area and associated work sites and accommodation facilities (such as workforce education, signs, boundary markers and fences)

Vehicle movements will be minimised as far as practicable, especially at night

Measures will be taken to ensure speed limits are appropriate and are being observed

Existing roads and tracks will be utilised for access where practicable

Bare vehicle tracks will be minimised following the rehabilitation of the pipeline corridor post-construction

Ramps and trench plugs with slopes of no greater than 50% will be located at least every 500m to assist fauna escape. Where possible, trench plugs will coincide with stock and wildlife trails

Sawdust-filled hessian sacks used to support pipes prior to laying-in will be soaked in water and placed in pairs at appropriate intervals. Branches, ramped gangplanks or similar will also be used to create 'ladders' at regular intervals to assist small fauna to exit the trench

Where possible, native shrubs will be allowed to regenerate to reduce the barrier to fauna movement, especially by small ground-dwelling fauna. Spreading of logs, hollows and dead timber across the disturbed areas within woodland fauna habitats will be carried out to facilitate small ground fauna movement.

All watercourses with fringing riparian woodland or floodplain eucalypt woodland will be crossed at right angles to minimise the distance transected. Clearing widths will be the minimum practicable within this habitat and the route will be aligned to avoid mature trees with hollows and permanent waterholes and billabongs. Construction will occur during the dry season to avoid interruption of drainage.

Rehabilitation

Rehabilitation measures will be developed and implemented and will include:

- strategies to manage and enhance vegetation on site during all phases
- promoting and assisting natural regeneration with active management of weeds and animal pests. Edge effects such as colonisation by native pioneer species and natural migration of plant species from adjacent vegetated areas will be encouraged.
- Revegetation/reseeding efforts based on information gathered from the reference sites on soil types and existing local vegetation characteristics.

Element/issue	Terrestrial ecology – construction
	Revegetation species will be endemic. ***Weeds*** A biosecurity management plan will be developed and implemented during the construction and operation of the proposed pipeline. This plan will be based upon principles specified in the Queensland Biosecurity Strategy 2009-14 (DPIF 2008) and the Regional Pest Management Strategy 2004 – 2009 (CPMG 2008) for managing weed species and plant diseases, and will include: • A weed and plant pest and disease awareness program to educate personnel entering the construction site or associated areas (for example, laydown areas or temporary accommodation facilities) • Vehicle washdown procedures and identification of designated washdown facilities and authorised inspectors including consultation with Western Downs and Banana Regional Councils. • Agreed management measures in anticipation of potential outbreaks of weeds or plant pests and diseases. Personnel will be nominated and trained in emergency response, and resources will be available to ensure that weed infestations or plant pest and diseases can be managed and controlled quickly with minimal disruption to operations or disturbance to the environment. • Management procedures for the control of weed infestations and plant pest and diseases. Procedures will be developed in collaboration with the local government and other relevant pest management plans and procedures and include a combination of manual, chemical, biological and cultural control methods. Qualification requirements for personnel undertaking control measures, storage and handling procedures for herbicides and pesticides and timing of applications (e.g. prior to seeding) will also be outlined. • Surveillance of the right of way and adjacent surrounds prior to, during and after pipeline construction to monitor known weed species will be conducted, particularly following wetter periods to aid in the identification of weed species. ***Mosquito***s Equipment and materials used during construction will be stored in a manner that prevents retention of water. Drainage systems will be protected during construction to prevent surface water retention wherever possible. Natural drainage patterns will be protected during construction where possible and reinstated immediately following construction.
Monitoring	Routine visual monitoring of dust, water movement, weeds and the status of rehabilitation will be undertaken, particularly in areas supporting conservation significant species, to assess the effectiveness of control measures. In addition, qualified fauna spotters and handlers will survey the entire open trench daily Monitoring of rehabilitation, translocated species and weed species will be undertaken in accordance with the HSEMS, as summarised in Section 24.3.6 and a rehabilitation

Element/issue	Terrestrial ecology – construction
	monitoring program and any regulatory requirements Reference sites will be established and information on the vegetation structure and species composition including abundance will be collected. The sites will be located within designated vegetated buffer/retained areas within or adjacent to study area. The reference sites will be used to compare and monitor the effectiveness of the rehabilitation.
Auditing	The effectiveness of the terrestrial ecology control strategies will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring results, complaints, incidents and auditing results will be reported as described in Section 24.3.6
Corrective action	Actions will be specific to the impacts and may include: • Additional training and education of construction teams • Further weed or pest control measures or rehabilitation as identified by investigations

Table 24.6 Terrestrial ecology – operation

Element/issue	Terrestrial ecology – operation
Operational policy	To minimise the impacts to terrestrial fauna and flora as a result of construction activities
Performance criteria	No outbreaks of declared weeds as a result of Project operations No introduction of pest species as a result of Project operations
Implementation strategy	Appropriate measures will be applied so that vehicles remain on designated access roads and tracks Vehicle movements will be minimised, especially at night. Vehicles travelling along the right of way will be limited to an appropriate speed Continued implementation of the rehabilitation program and biosecurity management plan as detailed in Terrestrial ecology – construction in Table 24.5 Further rehabilitation works may be required in areas where vegetation establishment has been less than acceptable. Such works will be conducted in consultation with the relevant landholder.
Monitoring	Rehabilitation monitoring program will be developed and implemented to monitor the success of rehabilitation. The right of way will be monitored for weed species
Auditing	The effectiveness of rehabilitation and weed control will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring results, complaints, incidents and auditing results will be reported as described in Section 24.3.6

Element/issue	Terrestrial ecology – operation
Corrective action	Corrective actions may include: • Additional training and education of operations teams Further weed measures or rehabilitation as identified by investigations

24.8 Aquatic ecology

24.8.1 Environmental values

The gas pipeline corridor is mostly located within the Fitzroy catchment (Dawson and Don rivers), with connecting lateral pipeline sections located within the Condamine-Balonne catchments. The northern part of the route is in the Calliope River catchment.

There are no declared Wild Rivers along the proposed pipeline route.

Water quality/flow

The Condamine-Balonne and Fitzroy catchments are characterised as having high turbidity, suspended solids and nutrients linked to land use practices, loss of riparian vegetation and modification of flow regimes.

Water quality in the Calliope River catchment varies seasonally, but is generally characterised by moderate to high conductivity levels, low to moderate turbidity and low to moderate levels of nutrients. It is moderately to highly impacted by agricultural, industrial and urban land use, although mining is currently absent.

Waterways in the Dawson and Don River catchments typically contain little or no flow for much of the year except for the wetter, summer months. The Calliope catchment has a sustained base flow due to its connection to shallow underlying aquifers.

Fish and macrocrustaceans

Thirty-four fish species and three crustacean species have been recorded from the freshwater reaches of the Calliope catchment (C & R 2005) and 20 fish species from the Dawson and Don Rivers (Berghuis and Long, 1999). No notable fish species have been recorded from freshwater reaches of the Calliope catchment. Notable fish species from the Dawson and Don Rivers include *Scleropages leichardti* (saratoga or spotted barramundi), *Scortum hillii* (leathery grunter) and the subspecies *Macquaria ambigua oriens* (Fitzroy yellowbelly) all of which are endemic to the Fitzroy River catchment.

Twenty-six native fish species, three exotic fish species (FRC 2009; Hydrobiology 2006; EM 2005, 2008; DPI & F 2007) and two crustacean species have been recorded from the Condamine-Balonne catchment. Notable fish species recorded from the Condamine-Balonne catchment include Murray cod (*Maccullochella peeli peeli*), which is listed under the EPBC Act, and Darling River hardyhead (*Craterocephalus amiculus*) and silver perch (*Bidyanus bidyanus*), both of which are listed on the IUCN Redlist of Threatened Species.

Macroinvertebrates

No pipeline crossing sites surveyed during the dry season contained macroinvertebrate communities that would typically reflect good water quality / habitat conditions.

Aquatic habitat, macrophytes and wetlands

Aquatic habitats in the Dawson River catchment are generally poor due to extensive bank erosion, cattle droppings in creek beds and significant upstream development. Some areas of the Dawson catchment and the Calliope River have good aquatic habitat due to minimal upstream development, an absence of dams or weirs on the river, limited erosion, light grazing use, and good riparian vegetation cover. Aquatic habitats in the Condamine-Balonne waterways are mostly poor to very poor quality, although some sites have good aquatic habitat as a result of good channel and habitat diversity, minimal surrounding land use impact and good riparian connectivity and shading

Few macrophytes were recorded during dry season surveys, with the exception of the Calliope River site which had good species richness and coverage compared with sites in the Dawson and Don River and the Condamine-Balonne catchments. No notable macrophyte species were recorded throughout the catchments.

The Great Artesian Basin (GAB) spring wetlands, located on the outer edge of the GAB in Queensland, NSW and South Australia, are the only wetlands of national importance known to occur in the vicinity of the pipeline corridor. Communities of native species dependent on natural groundwater discharge from the GAB are listed as endangered under the EPBC Act. A number of these species are also listed under the Queensland *Nature Conservation Act* 1992 or the International Union for Conservation of Nature Redlist. Of these, two species, artesian milfoil (*Myriophyllum artesium*) and salt pipewort (*Eriocaulon carsonii*), are known to occur within the Springsure Supergroup and are also known to occur in Cockatoo Creek.

Geomorphology

The Dawson and Don catchments exhibited variable geomorphic characteristics. Most sites have experienced considerable disturbance, mostly in the form of vegetation clearance. Bed aggradation was a common feature although some sites had stable beds with good geomorphic features. Aggradation is the increase in land elevation due to the deposition of sediment. Banks were generally stable and riparian and floodplain vegetation and channel diversity was variable across the sites.

A single site surveyed on the Calliope River exhibited stable bed and banks with limited evidence of aggradation and reasonable bed variability. Groundwater percolation has extended the period of baseflow in the Calliope which has in turn maintained waterholes and riffle habitats (C & R 2005). Riparian vegetation was well developed along both banks although vegetation clearance was considered the dominant form of disturbance in a catchment context.

Downstream assessment sites within the Condamine-Balonne catchment exhibited infilling with all sites undergoing moderate aggradation, mostly sourced from gullying. Banks varied from moderately unstable to stable.

24.8.2 Potential impacts

Potential impacts from construction of the gas pipeline include:

- Increased delivery of sediments and nutrients to watercourses
- Direct removal of aquatic flora during excavation of road and pipeline crossings (rain-fed systems)
- Disturbance to notable fish species associated with increased total suspended solids and turbidity from pipeline and road construction

- Disturbance to threatened artesian spring communities associated with pipeline and road construction
- Temporary diversion of watercourses during construction of road and pipeline crossings
- Chemical or wastewater contamination from accidental spills
- Increased bank erosion (gullying) due to inadequate drainage control from exposed areas
- Trenching and re-laying of bank and bed sediments during construction of pipelines
- Enhanced breeding of mosquitoes through ponding of water during construction

Potential impacts from operation of the gas pipeline include:

- Erosion from exposed areas resulting in a reduction in the quantity and quality of aquatic habitat
- Chemical contamination of watercourses

These impacts can potentially affect the water quality, aquatic biodiversity and habitat quality, and geomorphology.

24.8.3 Aquatic ecology management

Table 24.7 Aquatic ecology – construction and operation

Element/issue	Aquatic ecology – construction and operation
Operational policy	To minimise direct and indirect impacts to aquatic biota water quality, aquatic habitat and geomorphology during construction of the gas pipeline
Performance criteria	Minimal changes to the aquatic flora and fauna No deterioration of water quality as a result of construction activities No changes to creek geomorphology as a result of construction activities No unauthorised release of contaminants directly or indirectly into watercourses
Implementation strategy	Erosion and sediment control devices will be designed and implemented according to regulatory requirements (Queensland 'Guidelines for Erosion and Sediment Control) Watercourse crossings will be designed to not impede flow and therefore the passage of fish and other organisms. Channel and banks will be monitored until rehabilitation is stable. The pipeline water crossings will be inspected at the end of each wet season. Mosquito management measures for construction related activities will be develop and implemented to address the 'Mosquito Management Code of Practice for Queensland ' Procedures will be implemented to maintain machinery and vehicles free from fuel and oil leaks Fuel and oils will be stored and handled to address regulatory requirements including provision of spill containment Stormwater management measures will be implemented to minimise impacts on the

Element/issue	Aquatic ecology – construction and operation
	aquatic environment Creek bed profiles will be restored and maintained on completion of construction Creek crossings and disturbance footprint will be minimised to only what is required for construction Backfilling, stabilisation and revegetation of riparian corridors will be undertaken The construction of roads or pipelines through or adjacent to artesian spring communities will be avoided, in particular the artesian mound springs in the vicinity of Cockatoo Creek.
Monitoring	Routine, regular and frequent visual monitoring will be undertaken while carrying out construction work and/or any maintenance of completed works in a watercourse or wetland Water quality, aquatic biota, aquatic habitat and geomorphology, upstream and downstream of creek crossings and dams, will be monitored based on risk prior to and during construction of roads and pipeline crossings Rehabilitated channels and banks will be monitored until the site is stable Pipeline watercourse crossings will be inspected at the end of each wet season until rehabilitation is successful Disturbed areas will be visually inspected to ensure ponding is kept to a minimum, particularly where relevant project activities are within 5km of major population centres
Auditing	The HSEMS audit will include the assessment of the adequacy of aquatic monitoring, information assessment and any remedial measures
Reporting	Monitoring results, complaints, incidents/near misses and auditing results will be reported to demonstrate compliance with performance criteria, the environmental authority and the HSEMS as described in Section 24.3.6. Reporting will also identify opportunities for improvement in accordance with the HSEMS
Corrective action	Corrective action will be taken based on the results of monitoring and auditing. The form of action will be aspect-specific but may include: • Modifications to stormwater controls • Improved techniques for the construction of creek crossings • If due to the petroleum activities, water turbidity increases in the watercourse, wetland or spring outside contained areas, works will cease and the sediment control measures will be rectified to limit turbidity before activities recommence • Further restoration or revegetation

24.9 Marine ecology

24.9.1 Environmental values

Port Curtis is a bay protected from the open ocean by Curtis and Facing Islands. Port Curtis has areas that are largely unaffected by human activity, as well as areas highly modified by port developments and various industries.

The Port Curtis region contains extensive wetland habitats including saltmarsh, saltpan and mangroves, and extensive seagrass beds. These habitats support species of conservation significance such as dugong and marine turtles, as well as fisheries production. The wetlands are classified as “Areas of state significance (natural resources)” under the State Coastal Plan.

The proposed pipeline crossing of The Narrows is within the Dugong Protection Area and the Great Barrier Reef World Heritage Area.

Seagrass meadows, mangrove and saltmarsh areas are the primary environmental features of interest in the vicinity of the proposed pipeline crossing. These vegetated habitats significantly contribute to the high primary productivity of estuarine areas.

The rocky intertidal and shallow subtidal environments in the study area are important foraging areas for various fish species, while man-made structures such as jetties and seawalls provide additional hard substrata within the Port Curtis region.

Extensive un-vegetated intertidal banks around Laird Point and Friend Point provide foraging opportunities for fish at high tide and shorebirds at low tide.

Water quality conditions within Port Curtis are generally good but strongly influenced by tides, with reduced water quality conditions typically occurring at low tide. Port Curtis can be described as ‘slightly to moderately’ disturbed according to the Australian and New Zealand guidelines for fresh and marine water quality (ANZECC/ARMCANZ 2000).

The environmental values to be protected for marine ecology are:

- Benthic assemblages and water quality
- Wetlands
- Cetaceans and dugong

24.9.2 Potential impacts

Two habitat types will be affected by pipeline construction:

- The intertidal areas including saltmarsh, saltpan, mangroves and intertidal mudlflats
- The subtidal sedimentary habitats in The Narrows

Horizontal directional drilling (HDD) is proposed for crossing The Narrows. HDD may result in the following impacts:

- Disturbance such as fragmentation of the mangrove and wetland areas during construction of the pipeline across the intertidal area, in particular clearing and grading of a workspace
- Underwater noise generated by drilling activities potentially affecting dugong and cetaceans
- Loss of drilling mud directly or indirectly into the marine environment.

In the event that HDD is determined not to be feasible, based on final engineering investigations or construction constraints, dredging equipment will be used to excavate a trench across the seabed of The Narrows into which the pipeline would be installed. Dredging may result in the following impacts:

- Disturbance of the subtidal habitat at the dredge location
- Creation of a turbid plume that is transported from the dredge location to elsewhere in Port Curtis
- Underwater noise generated by dredging activities potentially affecting dugong and cetaceans
- Disturbance such as fragmentation of the mangrove and wetland areas (including the saltpan/salt marsh habitat) during construction of the pipeline across the intertidal areas.

The pipeline across the intertidal habitat will be installed in an excavated trench and may result in the following impacts:

- Habitat fragmentation
- Locally altered tidal flows leading to impacts on saltmarsh plants and mangroves.

No impacts to the marine environment are anticipated during the operational phase of the pipeline.

24.9.3 Marine ecology management

Table 24.8 Marine ecology – construction

Element/issue	Marine ecology – construction
Operational policy	To construct the pipeline in a manner that has minimal impacts to the benthic assemblages, water quality, wetlands and cetaceans and dugongs
Performance criteria	Minimal disturbance to marine flora and fauna No unauthorised disturbance or removal of marine flora Minimal impact to marine water quality
Implementation strategy	Ponding across the saltpan/saltmarsh will be controlled Hydrodynamic changes across the saltpan/saltmarsh habitat will be minimised Modification of the natural characteristics of the wetland (including topography, groundwater hydrology, water quality and plant and animal species) will be minimised Area of disturbance across the saltpan/saltmarsh will be minimised **HDD** Area of disturbance for drilling and associated works will be minimised Drilling fluid and drilling mud for HDD will be contained through an appropriately designed storage area which will have a secondary containment system. Appropriate methods to transfer the residual drilling mud off site for disposal will be established **Dredging** Where practical, silt curtains will be deployed to prevent migration of turbidity plume Dredging will only operate within safe weather conditions, as defined by the Harbour

Element/issue	Marine ecology – construction
	Master to prevent spills Area of disturbance for dredging activities will be minimised A warning noise will be given so that marine fauna will move from the dredging area prior to commencing work.
Monitoring	Routine visual monitoring for ponding across the saltpan/salt marsh and silt screens will be undertaken to assess the effectiveness of control measures A process for visual observations and recording of dugongs and cetaceans will be established. Noise monitoring will be conducted during the construction phase to ensure applicable noise criteria is not exceeded
Auditing	The effectiveness of the marine implementation strategy will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring results, complaints, incidents and auditing results will be reported as described in Section 24.3.6
Corrective action	The following actions may be undertaken: • Maintenance of disturbed areas within the wetland to minimise ponding • Ceasing of drilling activities if drilling mud is released off site until material is contained • Increase maintenance of silt screens

24.10 Water resources

24.10.1 Environmental values

The pipeline route traverses parts of the Condamine-Balonne, Fitzroy and Boyne River basins, with the northern end located on Curtis Island.

The gas pipeline crosses numerous watercourses with the majority being ephemeral, with flow limited to the wet season between November and March. The only 'permanent' watercourses are the Calliope River and Cockatoo Creek, which are also fed from groundwater resources. A number of waterway crossings show evidence of erosion, in the form of gully and bank incisions.

Approximately 145km of the pipeline is located within the Surat basin which is part of the Great Artesian Basin. Springs and areas of seepage are abundant in the marginal regions of the Great Artesian Basin. Groundwater dependent ecosystems are common in spring areas and are classified as ecosystems which have their species composition and their natural ecological processes determined by groundwater (ANZECC/ARMCANZ 2000). The only spring complexes within the 5km radius of the pipeline route are located in the vicinity of where the pipeline crosses Cockatoo Creek.

Groundwater quality along the pipeline route, expressed in terms of electrical conductivity, is predominantly in the range of 1,000μS/cm to 2,500μS/cm. It is anticipated that groundwater will be most saline as the pipeline corridor approaches The Narrows and is influenced by the marine environment.

There are few licensed groundwater users in the vicinity of the pipeline corridor, however, there are a large number of users of groundwater for stock and domestic purposes within a 5km radius.

There are mud flats near the coast close to Gladstone in the northern reach of the pipeline route. The shallow groundwater associated with these mud flats is likely to be influenced by the marine environment.

Further detail on surface water quality and geomorphology is provided in Section 24.8.1.

24.10.2 Potential impacts

Groundwater

The construction and operation of the gas pipeline is expected to cause minimal impacts to groundwater due to the limited areas where it is anticipated that the pipeline could intersect the watertable.

The potential impacts on shallow groundwater associated with the construction and operation of the gas pipeline may include:

- Trench inflows/dewatering impacting on groundwater dependent ecosystems or groundwater users
- Alteration of local groundwater flow patterns
- Changes to rainfall recharge along the trench
- Drawdown effects to landholder bores due to taking water for construction and testing activities
- Contamination of shallow groundwater resources from spills of chemicals, fuels, or sewage
- Contamination of shallow groundwater from inappropriate storage or disposal of hydrotest water
- Increase of hydraulic conductivity in the trench creating a channel for preferential flow if backfill is not compacted.
- Elevated groundwater levels as a result of over compaction of backfill material

Surface water

The potential impacts to surface water from the construction and operation of the gas pipeline are:

- Contamination of surface water from inappropriate storage or disposal of hydrotest water
- Soil erosion, scour and sedimentation of waterways from inappropriate disposal of hydrotest water
- Changes in flood levels
- Sedimentation and erosion of waterways from clearing and trenching
- Scouring of creek beds due to insufficient depth of pipeline cover or scour protection measures
- Contamination of surface water from spills/leaks of chemicals and fuels or disposal of hydrotest water

24.10.3 Water resources management

Table 24.9 Water resources – construction

Element/issue	Water resources – construction and operation
Operational policy	To construct the pipeline in a manner that has minimal impacts to the surface water and groundwater
Performance criteria	To implement water efficiency measures for construction activities which require the use of surface or groundwater Maintain bed and banks stability of watercourses and environmental values of surface water and groundwater at pipeline crossings.
Implementation strategy	The pipeline alignment has been selected to minimise the number of crossings of watercourses, limiting the risk of encountering groundwater. Construction and operations will be as self-sufficient as practical for water requirements Crossings will be designed to minimise changes in erosion, scour and sedimentation regimes All major contractors will be required to detail water conservation measures Erosion and sediment control plans will be implemented The restoration of pipeline trenches and watercourse crossings will utilise construction techniques and erosion and sediment control methods to minimise erosion risk Creek crossings will be constructed in dry periods where practicable The necessary permits required will be obtained in the event that water is required to be sourced from a surface watercourse Disposal of hydrotest water will be undertaken in accordance with hydrotest management measures Acid sulfate soil management plans as described in Section 24.6 will be implemented The storage of hazardous materials, fuel and industrial or process chemicals will be in accordance with applicable federal, state and regional council requirements to prevent spills or unintentional releases to surface waters or groundwater Spills will be cleaned up and remediated as required If required for construction water, bores will be constructed and operated in accordance with license conditions
Monitoring	Routine visual monitoring including, erosion and sediment control measures, will be undertaken to assess the effectiveness of the water resource implementation strategies Post-construction monitoring of waterway crossing sites will be undertaken annually at the end of the wet season and any remedial works will be completed prior to the onset of the following wet season to achieve successful rehabilitation.
Auditing	The effectiveness of the water resource implementation strategies for the pipeline will

Element/issue	Water resources – construction and operation
	be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring, complaints and incidents will be reported through the HSEMS as described in Section 24.3.6
Corrective action	High risk incidents will be reviewed by senior management to ensure adequate controls are in place to minimise the chance of reoccurrence

24.11 Coastal environment

24.11.1 Environmental values

The Narrows is a narrow estuarine passage between Curtis Island and the mainland that extends from Raglan Creek in the north to Kangaroo Island in the south (at the northern end of the Western Basin). It ranges from 200m wide near Ramsay Crossing to approximately 1km wide between Graham Creek and Middle Creek.

Designated areas within this key coastal site include the Great Barrier Reef World Heritage Area, the Great Barrier Reef Coast Park, the Great Barrier Reef Marine Park (Mackay/Capricorn section) and areas listed on the Register of the National Estate.

Marine Water and Sediment

The marine sediments of The Narrows exist in layers comprised of grey to brown clays, loose sands and gravels ranging in thickness from 1.9m to 5.55m with the thicker sediment layers in the centre of the channel. There is an increased shell fragment composition in the upper sediment layers (upper 2m).

The estuary experiences high turbidity variation due to a combination of strong tidal currents and fine bed sediments. Reported turbidity within the Port of Gladstone (QGC 2009) exceeds Queensland Water Quality Guidelines of 6 nephelometric turbidity units for enclosed coastal waters.

Tides and Currents

The predicted current speed along the proposed pipeline crossing route is less than 0.50m/s for more than 80% of the time. The highest predicted current speed was 1.09m/s and occurred offshore from Friend Point. The peak current speed at the proposed pipeline crossing centre and offshore from Laird Point were 0.89m/s and 0.85m/s respectively

Waves

At the proposed pipeline route location, the significant wave height is predicted to be less than 0.3m for more than 85% of the year. For approximately 22% of this time the wave conditions are calm (significant wave height is less than 0.1m). The dominant wave direction is from the south-east

24.11.2 Potential impacts

The potential impacts from the construction of the pipeline using HDD (preferred crossing method) are as follows:

- Increased sediment load, deposition and contamination from loss of containment of drilling fluid or mud

- Land contamination from loss of containment of mud
- Erosion of shoreline
- Clearing of wetlands.

In the event that the HDD option is not adopted, the crossing will require the dredging of a trench. The potential impacts of dredging are as follows:

- Habitat disturbance and fragmentation
- Mobilisation of nutrients and contaminants reducing water quality
- Modification of flows and currents
- Impacts to flora and fauna including changes to feeding behaviour and smothering of benthic assemblages
- Generation of a turbidity plume
- Increased sediment deposition.

The potential impacts from wetlands crossing (trenching) are as follows:

- Disturbance of shorebird roost and feeding sites
- Adverse effects on fish, fish habitat, hydrology and downstream users
- Removal of vegetation and habitat disturbance.

Potential impacts to the coastal environment are only predicted to occur during the construction phase.

24.11.3 Coastal environment management

Table 24.10 Coastal environment – construction

Element/issue	Coastal environment – construction
Operational policy	To construct the gas pipeline across The Narrows and the wetlands with minimal impact to the coastal environment
Performance criteria	Minimal impacts to marine water quality Minimal disturbance to marine flora and fauna and no unauthorised disturbance Minimal impacts to marine sediments
Implementation strategy	The width of pipeline corridor activities and workspaces will be minimised and clearly identified for construction personnel The removal and disturbance of vegetation and ground covers will be minimised Stable access ways for heavy machinery will be designed to minimise disturbance of soft soils Drilling fluid and drilling mud for HDD will be contained through an appropriately designed storage area which will have a secondary containment system. Appropriate methods to transfer the residual drilling mud off site for disposal will be established Agreed methods to prevent shoreline erosion or disturbance due to pipeline crossing

Element/issue	Coastal environment – construction
	activities including excavation, dredging, and drilling works or access to marine plant and equipment will be implemented The construction schedule will take into consideration the potential impacts on shorebirds The pipeline drill hole profile for HDD will be designed based on adequate geotechnical data to avoid weak strata and potential cavities within the sub-surface sediments that could result in collapse of the drill hole, lost equipment, and redrills Dredging works will only be undertaken if HDD is not technically feasible or if a joint approach is not achieved. The appropriate dredge plant will be selected for the work and operations will be conducted in accordance with the agreed dredge management measures. The dredge management measures will include: • Provision for recreational vessel access through The Narrows while dredging is in progress • The use of silt curtains where practicable around shorelines • Disposal of material which will be in accordance with the Gladstone Ports Corporation approved reclamation works Structures for conventional dredging will be designed to align with 'fish friendly structure' guidelines The site will be rehabilitated and the structures in coastal and marine areas made safe following construction activities and decommissioning. Any structures required during construction e.g. anchor and winch foundations will be designed so as not to have a long term affect on flows in The Narrows and in consideration of ecological values Rehabilitation will take into consideration tidal and wave motion
Monitoring	Routine visual monitoring of silt control structures will be undertaken to assess their effectiveness. Water quality will be monitored during construction within the intertidal wetlands in accordance with the HSEMS. HSEMS monitoring is described in Section 24.3.6 to ensure water quality objectives are met. If dredging activities (alternative method) are required, water quality will be monitored to ensure agreed water quality objectives are met.
Auditing	The results of water quality monitoring will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring results, complaints, incidents and auditing results will be reported as described in Section 24.3.6
Corrective action	If pre-determined water quality objectives are not maintained, periodic cessation of dredging activities will occur

24.12 Air quality

24.12.1 Environmental values

The environmental values to be enhanced or protected are the qualities of the environment that are conducive to:

- Protecting the health and biodiversity of ecosystems
- Human health and wellbeing
- Protecting the aesthetics of the environment, including the appearance of buildings structures and other property
- Protecting agricultural use of the environment.

The pipeline study area is extensive and the ambient air quality is likely to vary significantly depending on the proximity to sources of air pollutants.

The majority of the pipeline study area is located away from major population centres in inner central Queensland. The main identified air pollutants in these areas are fine particulate material which maybe exacerbated by winds to form dust storms or from bushfires. Identified activities occurring in the area with the potential to influence the ambient air quality include mining, agriculture and industrial activities. These will generate air pollutants mainly from traffic, land clearing, stockpiling of materials, livestock movement and heavy machinery.

In Gladstone, at the northern end of the pipeline corridor, ambient air quality is influenced by industrial activities, other human activities as well as dust. Industries in the Gladstone regional air-shed include a major coal-fired power station, alumina refineries, cement manufacturer, and port facilities. Coal stockpiles and load-out infrastructure are an example of a port facility.

24.12.2 Potential impacts

Potential impacts primarily relate to dust generation during the construction of the gas pipeline. Key construction activities that may emit dust include:

- Access to the pipeline corridor by motor vehicles, particularly trucks and machinery
- Clearing and grading the right-of-way
- Vehicle movements associated with stringing the pipeline, welding, non-destructive testing and joint coating
- Trenching
- Rock blasting
- Sourcing and placement of bedding and padding
- Pipe trench backfilling
- Clean up and rehabilitation.

Elevated concentrations of dust can potentially impact on human health, terrestrial flora and fauna and agricultural production.

Emissions during the gas pipeline operations will be limited to pipeline inspections, periodic maintenance and emergency releases of coal seam gas. The potential impacts to the existing air

environment from these activities will be negligible due to the limited quantities of emissions and/or the infrequent nature of these activities.

24.12.3 Air quality management

Table 24.11 Air quality – construction and operation

Element/issue	Air quality – construction and operation
Operational policy	To construct the gas pipeline in a manner that has minimal impact on the existing air environment
Performance criteria	No air quality complaints from sensitive receptors No adverse impacts to terrestrial flora and fauna from air emissions
Implementation strategy	Wastes will not be burnt on-site Cleared areas will be minimised by utilising existing easements as far as possible Construction activities will consider adverse weather conditions to reduce or control dust emissions Where required dust control measures will be implemented which may include the use of water trucks Where works are conducted near residential dwellings, care will be exercised to ensure that the risk of adverse dust and air impacts at the receptor are minimised. This may include a reduction in speed limit. Vehicles and machinery will be fitted with appropriate control equipment and routinely maintained Vehicles travelling within the worksites will be limited to an appropriate speed for the conditions and safety Soiling of sealed public roads from Project activities will be cleaned as soon as practicable The route of new access roads will be selected to avoid vulnerable soil types, where possible to minimise the generation of bull-dust. Dust suppression measures will be implemented as required including watering and temporary sheeting Trucks carrying dusty, erodible materials will be covered Root stock will be retained in the ground where practicable to reduce erosion and to facilitate rapid rehabilitation e.g. trees will be trimmed and retained rather than removed where practicable Clearing of the right-of-way will be conducted having regard to soil type, terrain and construction requirements Trenching will be conducted having regard to soil type, terrain, construction requirements and weather conditions. Controlled blasting will be conducted only where conventional excavation, rock hammering or trenching equipment is ineffective

Element/issue	Air quality – construction and operation
	Procedures will be developed that will aid in the minimisation of dust emissions from controlled blasting, such as watering of the blast area. Dust emission minimisation measures will be implemented as required in the production of padding material on-site Clean up and rehabilitation will proceed as soon as is practicable after works are completed to minimise exposed land Replacement of trench spoil, topsoil and vegetation, from separate stockpiles to ensure rehabilitation works can proceed quickly and effectively
Monitoring	Weather forecast will be reviewed daily to ascertain necessary dust control measures Routine visual monitoring of dust will be undertaken to assess the effectiveness of the dust control measures If directed to by the administering authority in response to a valid dust complaint, monitoring of dust will be undertaken in accordance with the HSEMS, as summarised in Section 24.3.6 and the requirements of the environmental authority.
Auditing	The effectiveness of the dust controls and vehicular maintenance will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring results, complaints, incidents and auditing results will be reported as described in Section 24.3.6
Corrective action	Complaints received will be acted on as soon as practical. Where investigations reveal an impact, corrective action will be implemented to mitigate the impact. Actions will be specific to the impacts and may include: • Further dust suppression of unpaved roads, access tracks and exposed construction areas as appropriate • Reducing speed limits on unpaved roads and tracks adjacent to dwellings • Limiting dust-generating activities

24.13 Greenhouse gases

24.13.1 Environmental values

Emissions of Greenhouse gases like carbon dioxide, methane and nitrous oxide have been strongly linked to changes in climate. In 2007, global greenhouse gas (GHG) emissions were of the order of 29,000 million tonnes CO2-e. Australia's contribution was ~2% of global GHG emissions.

The scopes of GHG emissions are:

- Scope 1 GHG emissions are produced directly from combustion and fugitive sources in the gas fields
- Scope 2 GHG emissions arise from purchased electricity, heat and steam. These emissions are generated outside of the Project boundary. Note that the Project will purchase negligible amounts of electricity, heat or steam therefore scope 2 GHG emissions are negligible

- Scope 3 GHG emissions are related to the activities of the reporting entity but arising from sources beyond the reporting boundary – for example, extraction, processing and transport of purchased fuels.

24.13.2 Potential impacts

During the construction phase, Scope 1 and 3 GHG emissions will be produced from the diesel consumed by:

- Onsite construction related transport, earth moving equipment and other machinery
- Transport of consumables
- Power generation.

Scope 1 GHG emissions will also be produced from clearing of vegetation during the construction phase.

During the operational phase, Scope 1 GHG emissions will arise from fugitive emissions from the gas pipeline.

The total Scope 1 and 3 GHG emissions over the life of the project is 925,000t CO_2-e including 0.005Mt CO_2-e during the operational phase. This represents 0.003% of Queensland's annual GHG emissions and 0.001% of Australia's GHG emissions.

24.13.3 Greenhouse gas management

Table 24.12 Greenhouse gases – construction and operation

Element/issue	Greenhouse gases – construction and operation
Operational policy	To minimise greenhouse gas emissions from the construction and operation of the gas pipeline
Performance criteria	GHG management measures to monitor and assess GHGs from the Project on an ongoing basis have been implemented
Implementation strategy	Ongoing processes will be developed for minimising energy consumption and GHG emissions. These will include regular review of new technologies and research Less energy intensive construction materials will be considered during design phase of the Project A leak detection and repair program will be developed and implemented Transport logistics will be optimised to minimise energy consumption and use the most fuel efficient vehicles and machinery Opportunities for carbon offsets using biodiversity offsets will be considered
Monitoring	The effectiveness of the greenhouse gas management measures will be assessed during HSEMS and compliance auditing as described in Section 24.3.6 Monitor greenhouse gas emissions in accordance with the *National Greenhouse and Energy Reporting Act 2007*
Auditing	The effectiveness of the greenhouse gas management measures will be assessed

Element/issue	Greenhouse gases – construction and operation
	during HSEMS and compliance auditing as described in Section 24.3.8. Periodic energy audits will be undertaken to assist in improving energy efficiency
Reporting	Report greenhouse gas emissions in accordance with the *National Greenhouse and Energy Reporting Act 2007*
Corrective action	If reporting shows greater than expected greenhouse gas emissions, a review of GHG management measures will be undertaken

24.14 Noise and vibration

24.14.1 Environmental values

The noise environmental values are the qualities of the acoustic environment conducive to:

- Protecting the health and biodiversity of ecosystems
- Ensuring a suitable acoustic environment for individuals to sleep, study or learn, or be involved in recreation including relaxation and conversation
- Protecting the amenity of the community.

In relation to vibration, the structural and cosmetic integrity of non-indigenous cultural heritage sites and dwellings is to be protected.

The ambient noise levels in the vicinity of the gas pipeline route are expected to be general very quiet with morning and evening bird-chorus, evening insect chorus and daytime vegetation rustling generated by breezes .

Human noise is generally expected to be limited to intermittent traffic noise near significant roadways, low levels of night-time air-conditioning and domestic noise emitted from dwellings in inhabited areas. Sounds of distant agricultural processes in cultivated areas are seasonally significant. Intermittent stock calling noise can also be significant at night in pastoral areas.

Daytime background noise levels in remote areas are typically less than 25dBA, and night-time background levels are typically less than 15dBA.

Ambient ground vibration levels are generally not expected to be significant along the gas pipeline route as there are few major roads or other human activity in the immediate area adjacent to the gas pipeline.

Friend Point, where the proposed gas pipeline is to cross The Narrows, is very sparsely settled rural land and shallow estuarine waterways. The nearest identified dwelling is located 5km to the west of Friend Point.

The marine environment supports a number of aquatic species such as dugongs, dolphins, turtles and a wide range of fish species. The ambient underwater noise level in the vicinity of the gas pipeline crossing was measured at approximately 155-165dB$_{(peak)}$ and 103-130dB(M_{mf}). Snapping Shrimp were identified as the dominant ambient marine noise source throughout the study area.

Vessel pass-bys were much quieter with underwater noise levels of less than 140dB$_{(peak)}$ and 113-126dB(M_{mf}) for a pilot boat measured over 90 seconds at a distance of 150m.

24.14.2 Potential impacts

Noise and vibration will be generated from the construction of the gas pipeline including:

- Horizontal directional drilling (HDD) for crossing of The Narrows
- Trench dredging of The Narrows if HDD is not technically feasible
- Boring for crossing major roads, railways and waterways
- Pipeline trenching using a continuous trencher or excavator
- Pipeline trenching using an excavator-mounted rock-breaker, rock-saw and blasting in areas of continuous rock
- Temporary accommodation facilities
- Traffic and transportation of pipes, equipment and workforce
- Pressure release during operations.

The generated noise and vibration from construction is not expected to result in significant noise impacts on sensitive receptors or marine mammals. Overall, airborne noise associated with construction activities has the potential to cause short-term noise nuisance at the nearest sensitive receptors.

Noise associated with operation of the gas pipeline is expected to be minimal and confined to rare occasions when pressure release may be necessary for safety or maintenance reasons. Any such depressurisation will occur at main line valves or scraper stations over a short period.

24.14.3 Noise and vibration management

Table 24.13 Noise and vibration – construction

Element/issue	Noise and vibration – construction
Operational policy	To construct the gas pipeline in a manner that has minimal noise and vibration impacts on the surrounding residences To construct the gas pipeline in a manner that has minimal noise and vibration impacts on the biodiversity of marine species
Performance criteria	No verified complaints from landowners
Implementation strategy	Construction deliveries between 6.30pm and 6.30am shall be minimised Out-of-hours (6.30pm to 6.30am) construction activities within 2km of potentially affected residences will be restricted A traffic management plan will be prepared prior to construction identifying suitable routes and times of travel to minimise disturbances to residents and traffic conditions The pipeline will not be located within 100m of sensitive dwellings or commercial premises Temporary accommodation facilities will be located at an appropriate distance from potentially affected residences Dwellings or commercial premises located with 200m of the pipeline will be notified

Element/issue	Noise and vibration – construction
	prior to the commencement of daytime non-standard trenching operations (such as rock-sawing, rock-hammering or directional-drilling) Out-of-hours standard trench excavation and other pipeline construction operations within 1km of a residence will be conducted in consultation with the landholders and in accordance with agreed noise management measures Out-of-hours non-standard operations within 2km of a residence will be conducted in consultation with the landholders and in accordance with agreed noise management measures Where concern about cosmetic or minor damage may arise as a result of significant 'noticeable' vibration, consultation with residents will be undertaken prior to construction commencement Blasting will be designed to comply with Section 440ZB Blasting requirements under the *Environmental Protection Act 1994* Lower vibration goals will be considered in the case of heritage-listed structures, or where there is elevated sensitivity of persons (e.g. infirmary) or building contents to vibration
Monitoring	Vibration monitoring will be conducted at potentially affected residences, businesses or heritage sites during blasting activities If directed by the administering authority in response to a valid noise complaint, monitoring will be undertaken in accordance with the HSEMS, as summarised in Section 24.3.6 and the requirements of the environmental authority. Noise monitoring will be undertaken in accordance with the latest edition of administering authority's *Noise Measurement Manual* or the most recent version of AS1055 Acoustics – description and measurement of environmental noise
Auditing	The effectiveness of the noise abatement measures and complaint monitoring, if conducted, will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	The results of monitoring and implemented abatement measures will be reported to the administering authority as required.
Corrective action	Corrective actions will be undertaken in accordance with the outcomes of inspections, monitoring results or advice given by the relevant administering authority In the event of a valid complaint about noise nuisance, noise management measures will be submitted to the administering authority within the reasonable and practicable timeframe Implementation of the noise management measures will occur no more than 30 days following submission. Following implementation of the noise management, noise measurements will be taken to ensure compliance with applicable criteria. A report will be subsequently submitted to the administering authority to confirm compliance

24.15 Waste management

24.15.1 Environmental values

The environmental values to be protected and enhanced are:

- Life, health and well-being of people
- Diversity of ecological processes and associated ecosystems
- Land use capability, having regard to economic considerations
- Management of finite resources.

Liquid, solid and gaseous wastes will be generated throughout the construction, operation, decommissioning and rehabilitation phases of the gas pipeline. Generated wastes include regulated, general, recyclable and inert waste.

24.15.2 Potential impacts

Environmental impacts from waste will only occur as a result of poor management. The potential impacts include the following:

- Land and water (surface water and groundwater) contamination from inappropriate storage, handling and disposal of solid and liquid wastes
- Land and water contamination from spills during handling and transportation
- Land and water contamination from spills/overflows from extreme rainfall events
- Increased populations of vermin from inappropriate storage and handling of waste
- Visual amenity impacts due to poor housekeeping
- Inefficient use of resources
- Adverse effects to flora and fauna.

24.15.3 Waste management

Table 24.14 Waste management – construction and operation

Element/issue	Waste management – construction and operation
Operational policy	To implement the waste management hierarchy of avoid, re-use, recycle, recover and disposal To construct the gas pipeline in a manner that minimises adverse environmental and social impacts from waste
Performance criteria	No land and water contamination as a result of poor waste management No complaints from landowners regarding waste management Waste minimisation strategy established
Implementation strategy	Australia Pacific LNG will work with local councils to determine the current landfill capacities and accepted waste types. If required, this will include assisting with the planning of expansion and upgrade of landfills to ensure wastes generated from the

Element/issue	Waste management – construction and operation
	Project can be accommodated Waste management guidelines will be regularly reviewed including the marketability of wastes and the results of waste audits to improve waste management within the gas pipeline Acid sulfate soils will be managed in accordance with State Planning Policy 2/02 Planning and Managing Development involving Acid Sulfate Soils Waste management guidelines will be developed and implemented and include the principles of the waste management hierarchy and cleaner technology Contracts with companies will be established encouraging sustainable waste management practices Procurement of pre-fabricated materials will be encouraged to reduce the quantity of waste where practicable Wastes will be appropriately segregated and sealed within designated temporary waste management areas Waste will be transported by a licensed contractor to a recycling facility or suitable licensed landfill Bins and/or drums for regulated wastes will be sealed, labelled and stored within appropriately bunded areas and located within temporary waste management areas Liquid wastes will be stored separately to solid wastes to maximise recycling opportunities Spill kits will be strategically located along the gas pipeline corridor during both the construction and operational phases as required Package sewage treatment facilities will be appropriately designed and include alternative storage and disposal options during times of system failure and in conditions that prevent discharge to land (that is during rain events) Hydrotest water will be appropriately managed to minimise land and water contamination and erosion Vegetation material (including mulching) will be used on-site during rehabilitation where appropriate Vegetation and soil stockpiles will be located within cleared areas and away from drainage lines Vehicles and machinery will be fitted with appropriate emission control equipment and maintained in a proper and efficient manner in accordance with the manufacturer's specifications. Dust mitigation measures will be implemented Segregation of wastes will occur to maximise re-use and recycling opportunities
Monitoring	Regular reviews of the waste management register will be conducted to monitor the implementation of the waste management hierarchy

Element/issue	Waste management – construction and operation
	Sewage treatment facilities will be regularly monitored to ensure wastewater discharge meets regulatory requirements Routine visual inspections will be carried out at each work area and at accommodation facilities. A complaints register will be maintained for complaints regarding waste management
Auditing	The effectiveness of waste management measures will be assessed during HSEMS and compliance auditing as described in Section 24.3.8 including: • Potential impacts from wastes • Waste transportation records Implementation of the principles of waste management hierarchy
Reporting	Regulated waste tracking records will be kept on site and provided to the administering authority as required. Annual reports will be provided to the National Pollution Inventory (NPI)
Corrective action	Any spillage or release of waste that may potentially harm the environment will be contained and/or cleaned up as soon as practicable Complaints and incidents will be reported and corrective actions identified, responsibilities assigned and timeframe to complete the actions established. Recommendations/corrective actions will be undertaken in accordance with the outcomes of monitoring and audits Incident reports and actions will be closed out in accordance with the HSEMS

24.16 Traffic and transport

24.16.1 Environmental values

Road

Four key State-controlled roads and numerous local roads occur within the study area which will be used to carry construction and/or operational traffic throughout the life of the project including the Dawson Highway, Burnett Highway, Leichhardt Highway and Warrego Highway.

There is only one bridge with load restrictions that is relevant to the construction of the gas pipeline. This bridge is located on Dogwood Creek, just outside of Miles.

The Warrego Highway, just west of Dalby is the only road link within the gas pipeline study area that has been identified as having high crash risk ratio. Most of the accidents have occurred at the Condamine Street intersection.

Within the gas pipeline study area, the public transport network includes school bus services and a limited taxi service in some of the towns. Due to the limited road network and the dispersed nature of residents in relation to schools, the majority of the roads used by Project traffic are also school bus routes.

A number of stock routes which enable pastoralists to move livestock without the use of trucks and other transport methods have also been identified within the gas pipeline study area. These are typically roads, reserves, unallocated state land and pastoral leases.

Rail

There are two railway systems in the vicinity of the gas pipeline study area: Moura system and the Western system.

The Moura system services several coal mines and is comprised of a single line with passing loops, which have recently been extended to allow 'Blackwater' size trains to operate in this system. There are a number of major plans for this system identified in Queensland Rail's Coal Rail Infrastructure Master Plan, 2008. This includes providing for additional capacity with more passing loops constructed, line duplication, and coverage to industrial areas extended. No passenger service is planned.

The Western System includes all the line west of Ipswich, operating between Toowoomba and Roma. This line carries a mix of long distance passenger trains, grain trains, and general freight, livestock, and coal trains. Coal is the predominant traffic between Toowoomba and Macalister. Outside of the grain season, at least 70% of the trains per week are transporting coal.

Sea

Australia Pacific LNG has identified two ports which may be used to import the gas pipeline. These are the Port of Gladstone and the Port of Brisbane.

Air

Miles aerodrome is approximately 12km south of Miles and is classified as an aircraft landing area. It is not registered or certified, there are no regular passenger transport services, and it is currently only used occasionally by eight-seater aircraft but is capable of accepting larger aircraft. There is an apron capacity for two aircraft and a small terminal. Western Downs Regional Council administers the Aerodrome and there are currently no published plans to upgrade the facility.

The Gladstone regional airport is currently operated by the Gladstone Regional Council. The airport caters primarily for business travellers and freight activities associated with the region's developed and emerging industrial complexes. Regular public transport services are currently provided by QantasLink, primarily using Dash 8 Series Q400 aircraft that can cater for 74 passengers.

Eight flights a day operate out of the Gladstone regional airport from Monday to Friday, with reduced services at the weekends.

The Biloela airport at Thangool is operated by the Banana Regional Council. The airport services Biloela and the other Banana Shire towns. There is an apron capacity for two aircraft. QantasLink operate a Dash 8 fleet out of the Biloela Airport, which is mainly made up of Q200 aircraft seating 36 passengers.

24.16.2 Potential impacts

The traffic associated with the construction of the gas pipeline may have the following impacts:

- Increased traffic on local roads
- Increased turning movements on intersections of state-controlled roads with council-controlled roads

- Accelerated deterioration of some road pavements
- Increased traffic on high or very high crash risk roads
- Increased traffic along roads also used as school bus routes
- Increased dust, noise, spread of weeds and pests, and spills
- Increased rail transport and construction of additional facilities should the pipe be transported by rail
- Increased shipping movements at Port of Gladstone
- Increased traffic through Gladstone regional airport, Miles aerodrome and Biloela airport.
- Disruption during construction of pipeline road and rail crossings

Potential impacts to traffic and transport are only predicted to occur during the construction phase.

24.16.3 Traffic and transport management

Table 24.15 Traffic and transport – construction

Element/issue	Traffic and transport - construction
Operational policy	The gas pipeline will be constructed, operated and maintained with sustainability measures that will provide long term community benefits while limiting traffic impacts, as far as practicable The gas pipeline will be constructed, operated and maintained without compromising Australia Pacific LNG's commitment to safety
Performance criteria	Minimal impact on safety and minimal increase in congestion on key roads Participation in company-provided transportation for workforce movements. Project employees trained in driving safety, have near misses reported and avoid an increase in accidents
Implementation strategy	Traffic management and logistics plans will be developed to reduce total vehicular travel distance and risk of accidents from the pipeline project. These will be implemented across all four modes of transport Australia Pacific LNG will work with Federal, State, local government and industry with respect to infrastructure modifications, potential upgrades and maintenance which may be required to meet the increased demands on the regional and local transport network. Modifications may include access road construction, flood mitigation measures, intersection and road modifications, pavement rehabilitation and road maintenance Road and bridge construction practices and technologies will be selected based on factors including the reduction of environmental impact and energy use. Road and rail infrastructure crossings will utilise, as far as practical, construction techniques such as a boring Stock routes will be avoided as far as practicable. Any use of stock routes will be planned in consultation with DERM, local council and stakeholders

Element/issue	Traffic and transport - construction
	Consultation will occur with Western Downs, Gladstone Regional and Banana Shire Councils and relevant Government agencies and service providers to determine the most appropriate use of the relevant airport/aerodromes Australia Pacific LNG will provide transport (e.g. buses with a 20 seat capacity) to and from key construction and other sites from designated pick up areas or local airports Journey management plans will be developed and implemented and these will incorporate fatigue management. Key employees and contractors will be provided with driver training. Two driver safety training programs have been offered to employees and contractors in the past year with over 260 employees having completed these courses. These programs will be extended in future Road safety will be maintained using clear road signage, improved road alignments and intersection geometry Alternative access arrangements will be provided should access roads be temporarily closed during open cut road crossings. Consultation will be undertaken with council and affected land owners prior to construction works Measures, including project-based speed limits, will be implemented to reduce, as far as practicable, the generation of dust by project vehicles Access roads to temporary facilities, such as laydown yards, will be decommissioned unless relevant government agencies or landholders agree to retain the roads
Monitoring	Routine HSE monitoring will provide data on near-misses and traffic accidents (incident reporting system). Data will be compiled on participation in and influence of the provision of transportation to reduce low occupancy vehicle use The ratio of employees completing safe driving training courses vs. total number of employees will be monitored
Auditing	The contracts for Construction Contractors will include the provision for an audit under their Construction HSE Management Plan. Audits will be conducted in the first half of the contract duration. The effectiveness of the traffic and transport mitigation measures will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Data will be gathered and communicated through existing HSE reporting systems. Independent reports will be produced for any investigations triggered by a complaint or an audit finding
Corrective action	Complaints received will be acted on as soon as practical. Where investigations reveal an impact, corrective action may include: • Selection of alternative routes or modifications to logistics plan as required and/or traffic monitoring will target the particular route • If journey management plans are insufficiently or incorrectly completed, then toolbox talks will be prepared to reinforce the training

24.17 Indigenous cultural heritage

24.17.1 Indigenous cultural heritage values

Under Queensland's *Aboriginal Cultural Heritage Act 2003*, assessment of significance is a matter solely for the Aboriginal Parties involved. Sites listed on International or National Heritage Registers (because of joint Indigenous/non-indigenous values), can be partially assessed for significance using the principles in the Burra Charter (Marquis-Kyle and Walker 1992). All significant Indigenous sites and places in the gas pipeline area will be addressed in cultural heritage management plans negotiated with each Aboriginal Party.

There are a small number of Indigenous cultural heritage sites listed on the various local, state and Commonwealth heritage registers within the 10km wide gas pipeline study area. These are:

- One site, the Great Barrier Reef, is listed on the Register of the National Estate and World Heritage register exist within the gas pipeline corridor
- A total of 71 Aboriginal heritage sites are listed on the Aboriginal Cultural Heritage Register within the gas pipeline study corridor. Of these, 11 sites are located within 1km of the pipeline route. The nearest listed site is approximately 230m from the preferred pipeline route
- The Calliope Shire heritage register has a small number of sites with solely Aboriginal significance however these sites are located outside the study corridor.

The gas pipeline corridor is covered by the following Aboriginal parties:

- Barunggam People (QC99/05)
- Western Wakka Wakka (QC99/04)
- Iman People #2 (QC97/55)
- Wulli Wulli People(QC00/7)
- Gangulu People (QC97/36)
- Gap Area (the Narrow's)
- Port Curtis Coral Coast (QC01/29)

These parties are currently registered, or previously registered, Native title claim groups. The Aboriginal parties identified above were endorsed as Aboriginal parties in January 2010.

There is no identified Aboriginal Party for the marine area of the gas pipeline corridor. Public notices seeking to identify Aboriginal parties have been advertised in accordance with Part 7 of the ACH Act.

24.17.2 Potential impacts

The gas pipeline alignment will not have any impacts to registered cultural heritage sites. However, results of the systematic survey undertaken for a portion of the pipeline alignment identified numerous cultural heritage objects.

There is the potential for previously undetected Indigenous cultural heritage to be revealed during further site investigations, particularly during trenching. Unrecorded items of Indigenous cultural heritage are also likely to be identified in unexamined areas of the alignment.

Potential impacts to Indigenous cultural heritage are only predicted to occur during the construction phase.

24.17.3 Indigenous cultural heritage management

Table 24.16 Indigenous cultural heritage – construction and operation

Element/issue	Indigenous cultural heritage – construction and operation
Operational policy	To construct and operate the gas pipeline with minimal impacts to Indigenous cultural heritage values
Performance criteria	Preparation of an approved CHMP for each endorsed Aboriginal Party Implementation of approved CHMPs No unauthorised impacts to Indigenous artefacts
Implementation strategy	Site protection and management will be undertaken through the development of an agreed CHMP, recognising the primary role of Indigenous people in the custodianship of their heritage. CHMP procedures may include: • Avoidance of Indigenous cultural heritage, where practical • Further detailed field investigations • Relocation of cultural heritage items A primary component of the CHMPs will be managing cultural heritage: • Procedures for the identification and management of cultural heritage objects, areas and values. This may include additional assessment or material or sites • Management measures during construction may include: – Cultural heritage induction for the workforce and monitoring or specific construction activities – Procedures for unexpected finds – Procedures for the discovery of human remains – Processes for the management of the CHMP such as conflict resolution process. Following completion of the project, cultural heritage items recovered prior to construction and items identified and salvaged during construction may require management and curation. Issues relating to the storage of items of cultural heritage will be agreed upon and specified in the CHMP.
Monitoring	Any monitoring will be in accordance with agreed CHMPs.
Auditing	Compliance auditing against the requirements of the CHMPs will be undertaken.
Reporting	Reporting will be undertaken in accordance with the requirements of the agreed CHMPs
Corrective action	Corrective action measures will be development and implemented in accordance with each of the agreed CHMPs

24.18 Non-Indigenous heritage

24.18.1 Non-Indigenous cultural heritage values

The existing environmental values and shared heritage sites present in the gas pipeline study area are associated with exploration and settlement of the regions traversed by the pipeline.

Two sites within the pipeline study area are registered on Commonwealth, national and Queensland heritage lists and are listed in the Australian Heritage Places Inventory and associated contributing lists such as the World Heritage List, National Heritage List, Queensland Heritage Register and the Register of the National Estate (with much overlap).

There are 43 known non-indigenous heritage sites located within the 10km study corridor which are listed in local heritage registers and schedules to local environmental planning schemes, National Trust of Queensland and others recorded in local histories and heritage studies.

24.18.2 Potential impacts

There are four sites that may be impacted by construction of the gas pipeline:

- The curtilage of a corrugated iron shed, located beside Roche Creek Road . The shed itself is 200m from the pipeline route, however, associated artefacts may be found in the surrounding area
- The Mount Larcom provisional mining field, situated near the Calliope River. This mining field is crossed by the pipeline route
- The milking yards on Mount Larcom Station, 40m from the pipeline route
- The timber fence posts on Curtis Island, which will be directly impacted by pipeline construction.

All items are of low significance and of a local nature.

Indirect impacts may occur to two other sites:

- The Defence Road, located between the Eidsvold–Theodore Road and Camboon Station. Although there is only one road crossing, the pipeline alignment parallels the road for approximately 23km, passing within 110m of eight historic bridges and within 40m of the Cracow Creek Camp. There may be other features associated with road construction near the road. The Defence Road was built in 1943, during World War II and is potentially a site of State heritage significance. Increased construction traffic may result in unintended impacts to the road and bridges
- The jetty on Graham Creek.

There is the potential for previously undetected sites to occur in the pipeline corridor which may be impacted during construction.

It is anticipated that no impacts to non-indigenous cultural heritage will occur during the operational phase of the gas pipeline.

24.18.3 Non-indigenous heritage management

Table 24.17 Non-indigenous heritage – construction

Element/issue	Non-indigenous heritage – construction
Operational policy	Preservation of existing heritage sites of local, state and national significance during construction and operation of the pipeline
Performance criteria	No unauthorised impacts to non-indigenous cultural heritage sites
Implementation strategy	The placement of the pipeline will avoid, wherever practicable, previously recorded non-Indigenous heritage sites Field surveys will be completed following selection of the final proposed pipeline alignment to finalise locations and any expected impacts to heritage sites Although not expected, where heritage items are identified in the ROW, appropriate approvals and disturbance conditions will be obtained and implemented A building condition assessment will be carried out on vibration sensitive non-Indigenous heritage sites located within 100m of project activities that involve the use of rock breaking equipment, blasting or other activities likely to case significant vibration. Specific mitigation measures will be put in place to ensure that there are no detrimental impacts Procedures will be put in place to provide for the timely reporting and protection of heritage items and archaeological artefacts discovered during construction, consistent with requirements under the *Queensland Heritage Act 1992* The workforce will be inducted about the importance of non-Indigenous heritage sites and the procedures to be followed on their discovery The following actions will be implemented should a previously undetected non-indigenous heritage site be discovered: • Work in the vicinity of the suspected heritage site will cease and a temporary buffer of at least 50m will be established to ensure that impacts are avoided. • The Australia Pacific LNG Project Manager and Cultural Heritage Department Manager will be notified. • The Australia Pacific LNG Project's cultural heritage personnel will advise of the finding, and will inspect the suspected heritage items to assess them and ensure that the provisions of the *Queensland Heritage Act 1992* in relation to non-indigenous archaeological sites are met. • The Australia Pacific LNG Project Manager or Cultural Heritage Manager will liaise with officers of DERM to ensure heritage items are properly recorded, their significance assessed, and appropriate management measures implemented. These measures may include: the protection and avoidance of the site; investigation and recording of the heritage items; removal of the heritage items, advise the relocation of facilities; or excavation of the historical items and the removal for safekeeping.

Element/issue	Non-indigenous heritage – construction
Monitoring	All historical sites identified as potentially being impacted by Project activities will be monitored in accordance with the relevant approval and permit conditions
Auditing	The effectiveness of the implementation strategies and complaint monitoring, if conducted, will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	The results of monitoring and implemented abatement measures will be reported to the administering authority as required
Corrective action	Corrective actions may include: • Cease work in the immediate area and investigate • Fence off additional buffer • Relocate infrastructure

24.19 Social impact management plan

The Queensland State Government is working through a process for developing Social Impact Management Plans (SIMP) which is to be applied to all resource projects in Queensland. A draft SIMP has been developed for the Project to establish and define Australia Pacific LNG's management of social performance throughout the life of the project. . This is a work in progress and will continue to be developed in consultation with the government, community and other stakeholders over the life of the Project. The draft Project SIMP framework identifies and develops the strategies required to implement the proposed mitigation measures and opportunities for enhancement. The framework has three sections: Project Summary, Community Engagement Strategy and the Plan. Impact identification and assessment, mitigation strategies, responsibility, timing and performance measures are included in the Plan.

24.19.1 Project summary

Table 24.18 outlines the project summary in relation to development of the draft SIMP.

Table 24.18 Project summary

Reference	Project summary	
1.1	Location of Project	Refer to Volume 1, Chapter 3
1.2	Brief summary of the Project	Refer to Volume 1, Chapter 3
1.3	Description of the project's social and cultural area of influence	Refer to SIA (Volume 3, Chapter 20) Social Baseline Summary, Appendix B
1.4	Key social baseline study issues and statistics	Refer to SIA (Volume 3, Chapter 20) Social Baseline Summary, Appendix B
1.5	Potential contribution to regional development	Refer to Economic Assessment (Volume 3, Chapter 21)
1.6	Overview of SIA community engagement strategy including:	Refer to SIA (Volume 3, Chapter 20) – Sections 3 and 5

Reference		Project summary
	key stakeholders *	
	issues and concerns	
	community views, attitudes and aspirations	
1.7	Overview of proposed workforce profile (construction and operations) including workforce accommodation proposals	Refer to SIA (Volume 3, Chapter 20) – Section 4

* Refer to Community and Stakeholder Engagement Chapter (Volume 3, Chapter 2)

24.19.2 Community engagement strategy

Table 24.19 outlines the community engagement strategy in relation to development of the draft SIMP.

Table 24.19 Community engagement strategy

2		Community Engagement (CE) Strategy
2.1	List of key stakeholders x key interests including Indigenous stakeholders & interests.	Refer to SIA Section 3
2.2	Description of proposed CE strategy that promotes active and ongoing role for stakeholders throughout the project life cycle.	Australia Pacific LNG's community engagement strategy is guided by our Project Sustainability Framework, having particular regard to the following sustainability principles: • Engaging regularly, openly and transparently with people affected by our activities, considering their views in our decision–making and striving for positive social outcomes. • Working cooperatively with communities, governments and other stakeholders to achieve positive social and environmental outcomes, seeking partnership approaches where appropriate. Australia Pacific LNG's CE strategies to address these principles include: • Consulting early, openly and regularly with community stakeholders, including landholders and affected communities, non-government organisations, businesses and Indigenous groups. • Keeping community stakeholders informed of proposed project developments or activities pre-emptively through regular community briefings, including one-on-one discussions, open forum consultations, newsletters and media activities. • Ensuring that consultation processes enable the participation of social equity target group representatives. • Establishing participative processes that consider community ideas in key decision making outputs relating to construction,

2	Community Engagement (CE) Strategy	
		operations and decommissioning. • Establishing shopfronts at Miles to provide opportunities for people to seek information about the Project. • Continuation of a 1800-dedicated telephone hotline to receive public enquiries and complaints. • Providing dedicated liaison officers to manage all enquiries and complaints. • Investing in activities in partnership with local communities and government. • Planning and implementing social infrastructure investments through partnerships and collaborative arrangements between government, industry, educational and community organisations. Developing community programs in conjunction with members of the local community.
2.3	Management strategies to integrate CE strategy into project implementation at site level, and at local, regional and State levels.	**Site Level** Australia Pacific LNG is committed to integrating community engagement objectives into site level construction, operations and decommissioning activities. The following strategies and activities are proposed to ensure site level integration: • Ensuring key site level staff and contractors have a working knowledge of relevant Australia Pacific LNG community engagement policies and protocols. • Ensuring employees and contractors have an awareness and understanding of the Australia Pacific LNG's stakeholder engagement strategy, Indigenous engagement strategy and landowner protocol and receive community cultural awareness training and briefings. • Regular liaison between site management and corporate office to understand the results of community baseline and impact assessments and monitoring and identified communities of interest, including near neighbours and landowners. • Ensuring that identified communities are as fully informed as practically possible about site level activities and their possible effects. • Developing and maintaining a register of key stakeholders and of complaints at site level. • Tracking complaints from community members and the follow-up and sign-off by relevant managers. Ensuring early referral of difficult or unresolved complaints to Corporate Communications.

2	Community Engagement (CE) Strategy	
		• Participation of relevant site level managers in key community engagement activities; including community forums and any reference groups or Community Consultative Committee meetings that may be implemented. • Ensuring that internal decision making processes at site level consider the potential effects and opportunities of its activities on affected communities. **Local, regional and State level** As part of its community engagement strategy, Australia Pacific LNG is committed to ensuring that project implementation is integrated with broader local, regional and State level activities. The following strategies and activities are proposed to ensure that broader integration occurs: • Meeting with and regularly updating Mayors, CEOs and relevant officers of Regional Councils on operational issues and progress towards project milestones. • Maintaining regular dialogue with government agencies on key issues concerning relevant portfolios; including health, education, environment, infrastructure planning and transport. Participating in regional assessments and planning processes.
2.4	Mechanisms to support a regular review of the CE strategy's effectiveness.	Australia Pacific LNG will develop a monitoring and reporting framework that will incorporate mechanisms to regularly review community engagement strategies (see Social Impact Management Plan Implementation and Monitoring below).

24.19.3 Implementation and monitoring

Assessment of impacts

Potential impacts were assessed through a four stage process in accordance with the draft guidelines for Social Impact Management Plans received from the Queensland Department of Infrastructure and Planning in November 2009. It should be noted that this methodology was adopted to ensure consistency with the draft guidelines, is consistent across the gas fields, LNG facility and main gas transmission pipeline Social Impact Assessments, and that it differs to that adopted elsewhere in the EIS. The key stages in assessing potential impacts are summarised below.

Stage one explains each of the potential impacts, describing why these are regarded as an impact and demonstrating clearly whether the impact is positive or negative, direct or indirect, long-term or short-term, local or widespread and if it is reversible or irreversible.

Stages two and three qualify each impact based upon two assessment characteristics. These characteristics include an assessment of the probability of the impact occurring and an assessment of the actual result and scale of effect of an impact if it were to happen (that is, potential consequences).

Occurrence

The probability of occurrence for each impact is rated between 'low' and 'high,' as follows:

- High (81-100%)
- Medium (31-80%)
- Low (0-30%).

Consequence

The potential consequences may vary between 'low', 'medium' and 'high', and positive as follows:

- Low
  - Isolated issues or complaint that can be resolved via routine site procedures
  - Insignificant to minor social harm
  - No threat to social licence to operate
- Medium
  - Repeated incidents or community complaints that require significant adjustment to overall site level and business level procedures
  - Moderate social harm
  - Medium threat to social license to operate
- High
  - Significant, widespread and enduring community issue or dissent
  - Major to severe or irreversible social harm
  - direct threat to social license to operate
- Positive (+)

The fourth and final stage of the impact assessment process is to identify mitigation measures and opportunities for enhancement. The purpose of mitigation is to identify measures to safeguard the environment and the community affected by the Project. Where impacts are assessed to be positive, or where there is no, or only a minimal impact, opportunities for social enhancement are identified and measures for implementation are explained.

Implementation responsibilities

Australia Pacific LNG recognises that it has a significant role to play in the management and mitigation of impacts. However, effective impact mitigation requires the participation and collaboration of a range of stakeholders due to the complexity of the many issues involved.

In particular, government has a significant role in the planning and delivery of core services such as health, education, emergency services, transport and infrastructure, and employment and training initiatives. Where relevant, this draft SIMP nominates the appropriate State or Federal Government department which has a shared responsibility for the implementation and / or monitoring of a particular mitigation strategy.

The factors which contribute to the need for a shared approach to management and mitigation include:

- The scope of CSG to LNG activities
- The staging of activities (planning, construction, operations and closure)
- The breadth of current and future LNG industry and broader resource sector players (and therefore extent of risk for cumulative impacts)
- The diverse local, regional and broader governance contexts in which the project components exist (gas fields, pipeline and LNG facility).

Accordingly, the draft SIMP sets out the areas of responsibility for implementation of identified mitigation strategies under the following broad stakeholder categories:

- Australian Pacific LNG (this includes joint-venture partners and contractors)
- Government (local, State and Federal) – primary departments
- Industry (Oil and Gas)
- Shared Responsibility could include other parties in addition to those listed above such as:
  - Other government agencies where relevant
  - Private sector
  - Community.

The relevant Government Departments include but are not limited to:

- Federal Government:
  - Department of Education, Employment and Workplace Relations
  - Department of Infrastructure, Transport, Regional Development and Local Government
- Queensland Government:
  - Department of Premier and Cabinet
  - Department of Communities

- Department of Infrastructure and Planning
- Department of Education and Training
- Department of Employment, Economic Development and Innovation
- Department of Environment & Resource Management
- Queensland Police
- Department of Community Safety
- Department of Transport and Main Roads
- Queensland Health.

Timing

The draft SIMP designates the anticipated commencement timing for the implementation of mitigation strategies under the following categories:

- Pre-construction (PC)
- Construction (C)
- Operations (O).

Mitigation strategies that continue throughout the Project lifecycle (including construction, operation and decommissioning) are further designated as Life of Project (LP).

Measures and targets

Australia Pacific LNG has established a range of metrics, standards and qualitative criteria as measures or indicators of the relative performance of individual mitigation strategies. In selecting indicators, consideration has been given to the following criteria:

- Relevance of the indicator to the impact being measured
- Measurability
- Reliability of data sources and ease of data collection
- Current availability of data or the resources and capacity to collect new data.

The list of indicators included in the SIMP is not intended as a prescription for evaluating Australia Pacific LNG's ongoing performance. Rather, it is an aspirational starting point in an iterative process of implementation, review, modification and improvement. Australia Pacific LNG anticipates that, over time, different phases of the project may require different or modified performance measures and that some indicators may prove too difficult to measure or not as informative as originally anticipated. Not all indicators are intended for the public domain and the classification of performance measures in this regard will be guided by Australia Pacific LNG's monitoring and reporting framework (see below).

To assist in implementation of the SIMP, Australia Pacific LNG will develop appropriate targets against which to measure and report the performance of the SIMP over time. In setting targets, Australia Pacific LNG will take a broad and balanced approach, including consideration of:

- Baseline data
- Intended outcomes of individual mitigation strategies

- Australia Pacific LNG Project Sustainability Framework
- Industry standards
- Community expectations and aspirations
- Government requirements.

Targets will be periodically reviewed and updated to ensure their ongoing relevance to impacts being measured.

Critically, the success of the Australia Pacific LNG's performance against many of the measures outlined in the SIMP depends on government, particularly State Government, delivery on measures of its' own departmental policies and plans. These include *Toward Q2: Tomorrow's Queensland,* which describes five ambitions for the State, covering the economy, environment and lifestyle, education and skills, health and community, *Blueprint for the Bush* and the *Blueprint for Queensland's LNG Industry* which provides an outline of how the State Government will facilitate the development of the LNG industry in Queensland and work with local communities to ensure that any development of LNG resources is beneficial. The targets and performance measures for these initiatives are described in the Social Baseline in Volume 5 Attachment 51.

Monitoring and reporting

Australia Pacific LNG believes that effective monitoring of its activities is essential so that impacts can be accurately measured, mitigation measures assessed and meaningful reports provided to stakeholders. To this end Australia Pacific LNG will be developing a monitoring and reporting framework post EIS. The development of the framework will have regard to the following objectives:

- Build a sound understanding of the environmental, social and economic systems in which Australia Pacific LNG operates
- Share this knowledge with our communities of interest to assist in developing community capacity
- Assist in decision-making with respect to project design, delivery and investments throughout the project life cycle
- Track progress towards performance targets
- Assist Australia Pacific LNG to contribute to local and regional planning activities
- Promote an emphasis on learning, improvement and accountability
- Ensure that adaptive management occurs as part of continuous improvement
- Establish roles and responsibilities for monitoring and reporting
- Identify relevant indicators for internal versus external reporting requirements
- Report with an emphasis on outcomes and impacts, including at an intermediate outcome stage
- Assist Australia Pacific LNG to report on its overall performance against the company's sustainability framework.

Links between sustainability framework and Social Impact Management Plan

Australia Pacific LNG aspires to be at the forefront of sustainable practices, contributing to a positive future for our customers, our communities, our investors and people, delivering a positive benefit to people, communities and the environment. The Social Impact Management Plan is guided by our Project Sustainability Framework, having particular regard to the following sustainability principles:

- Fostering the health and well-being of our workforce
- Respecting the rights, interests and diverse cultures of the communities in which we operate
- Engaging regularly, openly and transparently with people and communities affected by our activities, considering their views in our decision-making and striving for positive social outcomes
- Working cooperatively with communities, governments and other stakeholders to achieve positive social and environmental outcomes, seeking partnership approaches where appropriate
- Upholding exemplary ethical behaviour in all aspects of our business
- Identifying, assessing, managing, monitoring and reviewing risks to our workforce, our property, the environment and the communities affected by our activities
- Ensuring that all employees and contractors work consistently with our sustainability principles, commitments, values and systems

24.19.4 Draft SIMP

Table 24.20 Draft social impact management plan

Identification	Assessment			Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
Population								
Cumulative: Increase in regional population.	Cons	M	M	• Australia Pacific LNG will provide housing for non-local construction staff and contractors in temporary accommodation facilities and will consult with stakeholders including the local council as part of the site selection process. • Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures. • Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its project to inform discussion and decision making in a timely manner.	L	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Communities (Housing and Homelessness Services) – Department of Infrastructure and Planning	PC C	• Number and percentage of persons employed by Australia Pacific LNG by social equity target group, occupation and position /seniority. • Functional working relationships are established with government, the community and other industries. • Evidence of joint stakeholder outputs (planning forums, communications, action plans etc.) to identify and mitigate potential cumulative impacts. • Relevant cumulative impact and regional planning strategies are acknowledged and reflected in Australia Pacific LNG planning documents and related communications. • Track and analyse community attitudes towards Project consultation processes and management of construction workforce issues....
Demographic Profile								
Change in community demographics due to construction workforce profile.	Cons	M	M	• Australia Pacific LNG will provide housing for non-local construction staff and contractors in temporary accommodation facilities and will consult with stakeholders including the local council as part of the site selection process.	L	• Australia Pacific LNG • Shared responsibility • *Government*	PC C	• Number and percentage of persons employed by Australia Pacific LNG by social equity target group, occupation and position /seniority.

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				• Australia Pacific LNG will uphold a high standard of behaviour and will communicate and strictly enforce its Code of Conduct and specific Accommodation Rules for all employees and contractors. • Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner. *Refer to 'community health and safety' mitigation measures.*		– Department of Communities (Housing and Homelessness Services) – Department of Infrastructure and Planning		• Track and analyse breaches of the Code of Conduct by incident type. • Track and analyse community attitudes towards Australia Pacific LNG's position and processes in relation to recruitment and workforce management. *Also refer to 'community health and safety' performance measures.*
Income and Affordability								
Cumulative: Increase in cost of living due to inflationary pressure from higher average weekly incomes.	Cons	M	M	• Australia Pacific LNG will provide housing for construction staff and contractors in temporary accommodation facilities and will consult with stakeholders including the local councils as part of the site selection process. • Australia Pacific LNG will continue to use and develop methods to attract people local to the region to the workforce. • Australia Pacific LNG will continue to use and develop methods to attract under-represented groups to the workforce. • The Australia Pacific LNG's workforce strategy will outline mechanisms for working with industry groups to develop opportunities for scholarships, apprenticeships and cadetships, outside as well as within, industry to ensure that as many people benefit as possible. • Australia Pacific LNG will work through committees established under the Sustainable Resource Communities Policy to identify housing market issues, forecasts and possible responses. • To mitigate potential impacts on housing affordability and availability, Australia Pacific LNG community programs will include working with government and agencies that provide	L	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Infrastructure and Planning – Coordinator Genera – Department of Communities (Housing and Homelessness Services)	PC O LP	• Percentage of construction workers accommodated at the temporary accommodation facilities. • Functional working relationships established with local councils, State Government, relevant agencies and committees.

Identification	Assessment			Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				housing to people in housing distress.				
Employment Training and Business								
Opportunity to increase labour-force participation and increase local skills capacity.	Cons Ops	L M	+ +	• The Australia Pacific LNG's workforce strategy will address: • In-house training programs. • Analysis of ongoing labour requirements. • Training strategies targeted to local labour. • Targeted employment and training programs. • Methods to attract people local to the region to the workforce. • Methods to attract under-represented groups to the workforce. • Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures. • Australia Pacific LNG will work together with the CSG/LNG industry through the CSG/LNG Skills Taskforce of Energy Skills Queensland to help address skill shortages by: • Raising awareness of the CSG/LNG industry in local communities. • Supporting vocational training. • Facilitating career advice and work readiness programs for new entrants and mature entrants from related industries. • Australia Pacific LNG will participate in CSG/LNG gateway programs with secondary schools in the Project region in partnership with providers such as the Queensland Minerals and Energy Academy to implement programs that promote career opportunities and facilitate employment in the CSG/LNG industry. • Australia Pacific LNG will continue to collaborate on programs	+ +	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Education and Training • Industry	PC O LP	**Employment** • Number of persons employed via government sponsored programs by length of time unemployed. • Number and percentage of persons employed by Australia Pacific LNG by social equity target group, occupation and position /seniority. • Functional working relationships are established with other industries. • Evidence of joint industry outputs (planning forums, communications, action plans, etc.) to identify and mitigate potential cumulative impacts. **Training** • Number of local residents participating in skills development programs offered by Australia Pacific LNG by social equity target group and occupation. • Number and percentage of apprentices and trainees starting, graduating and finding continuous employment with Australia Pacific LNG by occupation / operational area. • Evaluate Australia Pacific LNG community investment programs to assess the achievement of program goals and objectives

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				with government; training and education groups that build the local skills base both to meet the specific needs of the industry and other impacted sectors. This will include further development of apprenticeship, traineeship, scholarship and higher education programs. • To assist job seekers, readily accessible information and advice will be provided through the Australia Pacific LNG shopfronts, open days, the on-line recruitment portal and workshops.				
Opportunities for local and regional businesses to supply goods and services to the Project.	Cons Ops	H L	+ +	• Australia Pacific LNG will implement a local content strategy whereby it participates in or establishes programs which assist qualified local and regional businesses to access the opportunities to tender for provision of goods and services for the Project. • Australia Pacific LNG will ensure contracts with suppliers and sub contractors include provisions for sustainable growth of communities and are aligned with Australia Pacific LNG's sustainability principles and objectives.	+ +	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Employment, Economic Development and Innovation	PC O LP	• Percentage and dollar value of supplier contracts (Australia Pacific LNG and its contractors) awarded to businesses based in the local or regional area. • Track and analyse local business community attitudes towards the availability of supplier information and engagement with procurement of the local content strategy, including existing suppliers and non-suppliers.
Cumulative: Impact to local and regional businesses losing employees to the Project.	Cons	M	M	• Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures. • Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner.	L	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Infrastructure and Planning	PC O LP	*See employment and training and local content indicators above.* • Functional working relationships established with government and community organisations and evidence of partnership projects. • Evaluate Australia Pacific LNG community investment programs to assess the achievement of program goals and objectives.
Impact to operation of agricultural businesses	Cons	L	L	• Australia Pacific LNG will integrate and manage Project activities in consultation with landowners (refer to Community and Stakeholder Engagement Chapter, Volume 3, Chapter 2, for	L	• Australia Pacific LNG • Industry	PC O	• Track and analyse adherence to weed management procedures • Track and analyse landowner satisfaction

Identification	Assessment			Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				further information). • Australia Pacific LNG will continue working with the Government's Land Access Group to inform the development of an industry wide Code of Conduct for working with landowners. • Vehicle inspection and cleaning facilities will be used by Australia Pacific LNG at appropriate locations to mitigate against the spread of weeds. • Australia Pacific LNG will bury pipeline infrastructure to ensure continuity of farming activities. • Australia Pacific LNG's community investment programs will support sustainable community development.			LP	with consultation procedures • Ability for agricultural activities to continue after pipeline construction and remediation. • Evaluate range of community investment programs supporting local agricultural values.
Opportunities for apprenticeships, scholarships and vocational training.	Ops Cons	M L	+ +	• Australia Pacific LNG will continue to collaborate on programs with government, training and education groups that build the local skills base both to meet the specific needs of the industry and other impacted sectors. This will include further development of apprenticeship, traineeship, scholarship and higher education programs. • Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures. • Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its project to inform discussion and decision making in a timely manner. • Australia Pacific LNG will work closely with education providers to develop or utilise existing programs suitable for the industry, including programs that recognise prior learning, reducing impact on local educational institutions.	+ +	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Education and Training – Department of Infrastructure and Planning	PC O LP	*See employment and training indicators above.* • Evaluate Australia Pacific LNG community investment programs to assess the achievement of program goals and objectives • Expenditure on training programs • Number of apprenticeships and scholarships offered by the Australia Pacific LNG project
Opportunity to support work readiness	Ops	M	+	• Australia Pacific LNG will continue to develop or utilise existing	+	• Australia Pacific LNG	PC	• Functional working relationships

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			

programs and pre-trade training concepts.	Cons	L	+	local partnerships to assist students to transition from school to work or higher education.
				• Australia Pacific LNG will partner with local training providers to develop industry and employment skills.
				• Australia Pacific LNG will work together with the CSG/LNG industry through the CSG/LNG Skills Taskforce of Energy Skills Queensland to help address skill shortages by:
				  • Raising awareness of the coal seam gas / liquefied natural gas industry in local communities
				  • Provide vocational training.
				  • Facilitating career advice and work readiness programs for new entrants and mature entrants from related industries.
				  • Australia Pacific LNG will participate in CSG/LNG gateway programs with secondary schools in the Project region in partnership with providers such as the Queensland Minerals and Energy Academy to implement programs that promote career opportunities and facilitate employment in the CSG/LNG industry.
					+	• Industry
						• Shared responsibility
						• *Government*
						  – Department of Education and Training
							O
							LP
								established with training providers and industry groups.
								• Evaluate Australia Pacific LNG community investment programs to assess the achievement of program goals and objectives

Housing and accommodation								

Cumulative: Increase in housing and/or rental prices caused by increased demand and limited supply results in poor levels of housing affordability and an over-inflated market.	Cons	M	M	• Australia Pacific LNG will provide housing for construction staff and contractors in temporary accommodation facilities and will consult with stakeholders including the local council as part of the site selection process for these facilities.
				• Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures.
				• Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner.
					L	• Australia Pacific LNG
						• Shared Responsibility
						• *Government*
						  – Department of Communities (Housing and Homelessness Services)
						  – Department of Infrastructure and Planning
							PC
							O
							LP
								• Worker accommodation completed ahead of project demand.
								• Functional working relationships are established with government, the community and other industries.
								• Evidence of joint stakeholder outputs (planning forums, communications, action plans etc) to identify and mitigate potential cumulative impacts.
								• Relevant cumulative impact and regional planning strategies are acknowledged

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				• Australia Pacific LNG will work through committees established under the Sustainable Resource Communities Policy to identify housing market issues, forecasts and possible responses. • To mitigate potential impacts on housing affordability and availability, Australia Pacific LNG's community programs will include working with Government and agencies that provide housing to people in distress.				and reflected in Australia Pacific LNG planning documents and related communications.
Concerns that temporary accommodation facilities will foster anti-social behaviour and impact on host community.	Cons	M	H	• Australia Pacific LNG will continue consultation and engagement programs with communities and stakeholders to ensure their views are understood and considered throughout the life of the Project. • Australia Pacific LNG will uphold a high standard of behaviour and will communicate and strictly enforce its Project Rules and Accommodation Code of Behaviour upon all employees and contractors. • Australia Pacific LNG will design and construct a high quality temporary accommodation facility with sufficient social and recreational facilities. • Australia Pacific LNG will continue to implement community complaints procedure for community members and stakeholders to raise concerns, and in turn have them addressed in a timely manner.	L	• Australia Pacific LNG	PC C	• Track and analyse breaches of the Code of Conduct by incident type. • Number and type of community complaints made to Australia Pacific LNG, its contractors, local councils and others. • Track and analyse complaint response time and resolution. • Track and analyse workforce attitudes towards the physical and operational standards of the accommodation facilities
Cumulative: Increases in demand for hotel/motel accommodation presents challenges for competing local industry and businesses.	Cons	M	M	• Australia Pacific LNG will provide housing for construction staff and contractors in temporary accommodation facilities and will consult with stakeholders including the local council as part of the site selection process for these facilities. • Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures.	L	• Australia Pacific LNG • Shared Responsibility • *Government* – Department of Communities (Housing and Homelessness Services) – Department of Infrastructure	PC C	• Timely communication of project and workforce demands • Functional working relationships are established with government, the community and other industries. • Evidence of joint stakeholder outputs (planning forums, communications, action plans etc.) to identify and mitigate

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				• Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner.		and Planning		potential cumulative impacts. • Relevant cumulative impact and regional planning strategies are acknowledged and reflected in Australia Pacific LNG planning documents and related communications.
Community Health and Safety								
Potential for socially unacceptable behaviour due to the increase in population and changed demographics.	Cons	M	H	• Australia Pacific LNG will continue consultation and engagement programs with communities and stakeholders to ensure their views are understood and considered throughout the life of the Project. • Australia Pacific LNG will uphold a high standard of behaviour and will communicate and strictly enforce its Project Rules and Accommodation Code of Behaviour for all employees and contractors. • Australia Pacific LNG will design and construct a high quality temporary accommodation facility with sufficient social and recreational facilities. • Australia Pacific LNG will continue to implement community complaints procedure for stakeholders to raise concerns, and in turn have them addressed in a timely manner. • Health promotion programs relating to the 'Fit for Work' and 'Drug and Alcohol' policies will be implemented.	L	• Australia Pacific LNG	PC O LP	• Track and analyse participation of Australia Pacific LNG employees and contractors in health promotion programs and safety training initiatives. • Track and analyse results of employees and contractors alcohol and drug tests at Australia Pacific LNG. • Track and analyse breaches of the Code of Conduct by incident type. • Number and type of behavioural related complaints relating to Australia Pacific LNG workers and contractors made to Australia Pacific LNG, its contractors, local council and others. • Track and analyse community attitudes towards the conduct of Australia Pacific LNG workers.
Increase in road, air and shipping movements impacting on road and maritime safety and congestion.	Cons	M	H	• Australia Pacific LNG will work with the Federal, State and local government and industry in regard to potential upgrades required to meet the increase demands on regional infrastructure. • Australia Pacific LNG will develop a logistics management plan to efficiently move people and materials and to reduce the impact of traffic and transport on communities by:	M	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Infrastructure, Transport, Regional	PC	• Number of employee, contractor and community participants completing road safety programs and dollar value of program. • Number and type of traffic related incidents relating to Australia Pacific LNG

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				• consolidation of material prior to transport to reduce truck movements • siting logistic hubs (warehouses and lay down facilities) that divert traffic flows around local towns • the use of buses for personnel site access during construction and operations • appropriate travel restrictions • development and implementation of safe transportation management practices to reduce the impact to the local environment. • avoid travel along school routes during set down pick up times • night time travel managed where routes pass sensitive sites, e.g. residential and schools • speed restrictions especially next to sensitive sites – residential, schools or along unsealed roads to reduce dust creation • vehicles lights and warning lights illuminated as appropriate • implementation of driver training program • Regular monitoring of traffic and transport flows and adjustment to the logistic plan to correct 'pinch points' • Safe transportation management practices with minimal impact on the local environment developed and implemented by Australia Pacific LNG. *Refer to mitigation measures in traffic and transport section of EIS, Volume 3, Chapter 17.*		Development and Local Government – Department of Main Roads – Department of Infrastructure and Planning		workers and contractors. • Track and analyse community attitudes towards the project.
Facilities and Services								
Cumulative: Increase in demand on medical and health services.	Cons	H	M	• Australia Pacific LNG will collaborate with government, industry and other providers to mitigate the impact to health services in	L	• Australia Pacific LNG • Shared responsibility	PC	• Communication of workforce demand estimates to Queensland Health and local

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
				local communities including providing the appropriate level of medical facilities for its temporary accommodation facilities and operating facilities. • Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner. • Health promotion programs relating to the 'Fit for Work' and 'Drug and Alcohol' policies will be implemented.		• *Government* – Department of Infrastructure and Planning – Qld Health		councils within the region. • Number and type of lost workday cases related to illness. • Workforce participation rates for employee wellbeing program activities. • Number of workforce related visits to medical facilities outside of Australia Pacific LNG facilities.
Temporary reduced access to recreational areas.	Cons	L	L	• Australia Pacific LNG will continue consultation and engagement programs with stakeholders to ensure their views are understood and considered throughout the life of the Project and will communicate the extent and timing of any impacts to affected stakeholders and schedule works around minimal disturbance. • Australia Pacific LNG will continue to implement community complaints procedure for community members and stakeholders to raise concerns, and in turn have them addressed in a timely manner.	L	• Australia Pacific LNG		• Communication of Project works to affected stakeholders. • Track and analyse community attitudes towards the Project. • Number and type of community complaints made to Australia Pacific LNG, its contractors, local councils and others. • Track and analyse complaint response time and resolution
Increased demand on emergency services.	Cons	L	M	• Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner. • Australia Pacific LNG will collaborate with government, industry and other providers to mitigate the impact on health services in local communities including providing the appropriate level of medical facilities for its facilities. *See Volume 3, Chapter 22 for mitigation measures for hazard and risk as they relate to emergency services in the pipeline area.*	L	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Infrastructure and Planning – Qld Health	PC C	• Participation in and active contribution to regional planning activities as evidenced through relevant planning outputs (reports, minutes, media communications) and subsequent commitments • Relevant cumulative impact and regional planning strategies are acknowledged and reflected in Australia Pacific LNG planning documents and related communications.

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
Cumulative: Increased demand for community support services and facilities (for example, child care, airport, family services).	Cons	L	M	• Australia Pacific LNG will collaborate with government, industry and community partners on research programs to understand the social impacts and opportunities created by development in communities in which it operates. • Australia Pacific LNG's community investment programs will support sustainable community development by identifying and supporting programs that target community support services. • Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures. • Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner. *See Volume 3, Chapter 17 for mitigation measures for impacts on traffic and transport services and infrastructure.*	L	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Infrastructure and Planning – Department of Communities	PC O LP	• Communication of estimated workforce demands to Local Government, State Government and community service providers. • Australia Pacific LNG's participation in and active contribution to social impact research programs as evidenced through relevant planning outputs (reports, minutes, media communications). • Functional working relationships are established with government, the community and other industries to plan for cumulative impacts. • Evidence of joint stakeholder outputs (planning forums, communications, action plans etc.) to identify and mitigate potential cumulative impacts. • Relevant cumulative impact and regional planning strategies are acknowledged and reflected in Australia Pacific LNG planning documents and related communications. • Evaluate Australia Pacific LNG community investment programs to assess the achievement of program goals and objectives • Number of Australia Pacific LNG staff and contractors participating in community organisations, activities and events.
Community Values and Lifestyle								

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
Cumulative: The high level of construction activity will impact local community values and residents' lifestyle patterns.	Cons	M	M	• Australia Pacific LNG will collaborate with government, industry and community partners on research programs to understand the social impacts and opportunities created by development in communities in which it operates. • Australia Pacific LNG's community investment programs will support sustainable community development. • Australia Pacific LNG will ensure contracts with suppliers and sub-contractors are aligned with Australia Pacific LNG's sustainability principles. • Australia Pacific LNG will continue consultation and engagement programs with communities and stakeholders to ensure their views are understood and considered throughout the life of the Project. • Australia Pacific LNG will uphold a high standard of behaviour and will communicate and strictly enforce its Project Rules and Accommodation Code of Behaviour for all employees and contractors.	L	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Infrastructure and Planning	PC O LP	• Australia Pacific LNG participation in and active contribution to social impact research programs as evidenced through relevant planning outputs (reports, minutes, media communications). • Evaluate Australia Pacific LNG community investment programs to assess the achievement of program goals and objectives • Track and analyse community attitudes towards consultation processes and management of project impacts during construction and operational phases. • Track and analyse breaches of the Code of Conduct by incident type. • Number and type of community complaints made to Australia Pacific LNG, its contractors, local council and others. • Track and analyse community attitudes towards the conduct of staff and contractors. • Number of Australia Pacific LNG staff and contractors participating in community organisations, activities and events. • Track and analyse community attitudes over time, for example, social attitudes and experiences of community life, cultural diversity and social interactions.
Impact of lighting, dust, noise and traffic	Cons	M	M	• Australia Pacific LNG will work with government, the community	L	• Australia Pacific LNG	PC	• Functional working relationships are

Identification		Assessment		Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
to community amenity and lifestyle.				and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures. • Australia Pacific LNG will continue consultation and engagement programs with communities and stakeholders to ensure their views are understood and considered throughout the life of the Project. • Australia Pacific LNG will continue to participate in Local Government and regional planning processes and provide information about its Project to inform discussion and decision making in a timely manner. *See Volume 3, Chapter 7 for mitigation measures for potential visual amenity impacts.* *See Volume 3, Chapter 7 for mitigation measures for potential lighting related impacts.* *See Volume 3, Chapter 5 and 13 for mitigation measures for potential dust related impacts.* *See Volume 3, Chapter 17 for mitigation measures for potential traffic related impacts.* *See Volume 3, Chapter 15 for mitigation measures for potential noise related impacts.*		• Shared responsibility • *Government* – Department of Infrastructure and Planning	O LP	established with government, the community and other industries to plan for cumulative impacts. • Evidence of joint stakeholder outputs (planning forums, communications, action plans etc.) to identify and mitigate potential cumulative impacts. • Number of community information sessions relating to environmental impacts. • Number of community information sessions and participants. • Track and analyse local business community attitudes towards consultation processes and management of project impacts during construction and operational phases. *Also refer to performance measures for the Australia Pacific LNG Environmental Management Plan.*
Indigenous Australians								
Cumulative: reduced ability to access affordable housing.	Cons	L	H	• Australia Pacific LNG will work with government, the community and other industries to plan for potential cumulative impacts and share information relating to potential impacts and mitigation measures • To mitigate potential impacts on housing affordability and availability, Australia Pacific LNG's community programs will include working with Government and agencies that provide housing to people in financial distress	L	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Infrastructure and Planning I – Department of Communities	PC O LP	NB: • Number of Indigenous persons employed in construction and operational workforces by occupation and position / seniority. • Number of Indigenous businesses or joint ventures engaged through the Australia

Identification	Assessment			Management	Residual assessmen	Responsibly		Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****				
						(Housing and Homelessness Services)			Pacific LNG Project.
Difficulty in securing and retaining Indigenous employment on the project.	Cons Ops	H M	M M	• Australia Pacific LNG will continue to use and develop methods to attract under-represented groups to the workforce. • Australia Pacific LNG will aim to build collaborative partnerships with government and community organisations to enhance the capacity of employers to provide jobs and the capacity of locals to develop skills and secure jobs. For example through the Community Skills Scholarship program. • Australia Pacific LNG will develop an Indigenous engagement strategy to address recruitment and retention strategies specific to Indigenous Australians.	M M	• Australia Pacific LNG • Shared responsibility • *Government* – Department of Education and Training – Department of Communities – Aboriginal and Torres Strait Islander Partnerships	PC O LP		• Indigenous employment retention rates for construction and operational workforces. • Number of Indigenous residents participating in skills development programs supported by Australia Pacific LNG. • Number and percentage of Indigenous apprentices and trainees starting, graduating and finding continuous employment with Australia Pacific LNG by occupation / operational area. • Number of Indigenous apprenticeships, work experience programs, traineeships and scholarships supported by Australia Pacific LNG in non-LNG industries. • Functional working relationships established with local and regional Indigenous organisations. • Communication of estimated workforce demands to Local Government, State Government and Indigenous housing and other service providers. • Number of joint initiatives supported by Australia Pacific LNG and Indigenous organisations. • Number and percentage of Australia Pacific LNG employees and contractors completing cultural awareness training.
Lack of business development opportunities realised.	Cons	M	M	• Australia Pacific LNG will implement a local content strategy whereby we participate in or establish programs which assist qualified local and regional businesses with the opportunity to tender for provision of goods and services for the Project. • Australia Pacific LNG will ensure contracts with suppliers and sub contractors are aligned with Australia Pacific LNG's sustainability principles and objectives. • Australia Pacific LNG will develop an Indigenous engagement strategy to identify business opportunities and programs for development.	L	• Australia Pacific LNG • *Government* – Department of Employment, Economic Development and Innovation – Department of Communities – Aboriginal and Torres Strait Islander Partnerships	PC O LP		
Lack of respect for Indigenous Australians.	Cons Ops	M M	H H	• Australia Pacific LNG will implement cultural awareness program. • Australia Pacific LNG will support Indigenous stakeholders to participate in Caring for Country initiatives • Australia Pacific LNG will engage Indigenous Australians in a respectful and culturally appropriate way.	L	• Australia Pacific LNG	PC O LP		

Identification	Assessment			Management	Residual assessmen	Responsibly	Timing***	Performance measures
Impact **(For some impact categories, there are minimal Project-related impacts, but there are potential cumulative impacts when considering projects in the gas pipeline study area).**	**Phase(Cons, Ops)***	**Probability (H, M, L)****	**Consequence (H, M, L)****	**Management/mitigation strategies**	**H, M, L****			
								• Number of Indigenous people participating in cultural heritage management and natural resource management initiatives directly related to the Australia Pacific LNG project (see also Cultural Heritage Management Plan). • Track and analyse Indigenous community attitudes towards Australia Pacific LNG's position, processes and performance in relation to Indigenous development and Indigenous engagement.

* Cons = construction, Ops = operations

** H = high, M = medium, L = low, + = positive

*** PC = pre construction, C = construction, O = operation, LP = life of project

24.20 Hazard and risk management

24.20.1 Environmental values

The gas pipeline traverses primarily through rural areas, with beef cattle grazing the predominant land use. The larger communities near the pipeline are Miles, Wandoan, Taroom, Cracow, Theodore, Biloela, Mount Larcom, Calliope and Gladstone.

24.20.2 Potential impacts

The potential hazards identified for the gas pipeline include:

- Damage to infrastructure, overhead electrical transmission power lines and data cables
- Person, fauna or vehicle falling into open excavations or trenches
- Explosions and fires
- Wildlife and disease vectors
- Slow gas leak
- Gas pipeline rupture underground and at the surface
- Underwater gas leak from pipeline through The Narrows
- Gas explosion.
- Natural disasters including storms, cyclones, floods, lightning, heat wave and bushfire
- Vehicle and traffic hazards including:
  - Increased heavy and light vehicle traffic
  - Increased traffic at uncontrolled rail and road crossings
  - Uncontrolled detonation of explosives
  - Diesel fire
  - Increased marine traffic
  - Boat strike

Table 24.21 Hazard and risk – construction and operation

Element/issue	Hazard and risk – construction and operation
Operational policy	Australia Pacific LNG's sustainability principles will be applied to the planning, design, construction, operation and decommissioning of the gas pipeline to ensure associated hazards and risks do not adversely impact people or the environment
Performance criteria	Gas Field safety management plan in accordance with the requirements of the *Petroleum and Gas (Production and Safety) Act 2004* is implemented All bunding and storages of hazardous substances comply with relevant Australian standards
Implementation strategy	The pipeline will be constructed and operated under a safety management plan

Element/issue	Hazard and risk – construction and operation
	considering whole-of-life safety management in accordance with the requirements of the *Petroleum and Gas (Production and Safety) Act 2004*. The safety management plan will be updated as required during operations An up to date traffic management plan will be maintained. The traffic management plan will address: driver fatigue monitoring; driver education and training; enforced speed limits for project vehicles; use of buses to reduce private vehicle use; public access restrictions to work areas; and use of in-vehicle monitoring systems Australia Pacific LNG will initiate and participate in ongoing community campaigns to reduce the likelihood and consequences of vehicle accidents. The storage of hazardous materials, fuel and industrial or process chemicals will be in accordance with applicable federal, state and regional council requirements to prevent spills.
Monitoring	Monitoring of incidents will occur through the incident database and established HSEMS incident reporting system High risk incidents will be reviewed by senior management
Auditing	The effectiveness of the Safety Management Plan will be assessed during HSEMS and compliance auditing as described in Section 24.3.8
Reporting	Monitoring results, complaints, incidents and auditing results will be reported in accordance with the HSEMS as described in Section 24.3.6 The results of monitoring and implemented abatement measures will be reported to the administering authority as required.
Corrective action	High risk incidents will be reviewed by senior management to ensure adequate controls are in place to minimise the chance of reoccurrence Corrective actions will include a review and update to the safety management plan and any other related plans following completion of any incident investigation

24.21 Decommissioning and rehabilitation

Australia Pacific LNG will engage with stakeholders during all phases of the project including the decommissioning and rehabilitation phase. This engagement will inform stakeholders of the:

- The process of decommissioning
- Activities that will take place
- The potential impacts on stakeholders in the affected area.

In the event that the pipeline is no longer required, it will either be decommissioned or abandoned:

- Decommissioning - depressurising the pipeline, then capping and filling it with an inert gas such as nitrogen or water with corrosion inhibiting chemicals. The cathodic protection would be maintained to prevent the pipe corroding
- Abandonment - purging the pipe of natural gas, disconnecting it from the manifolds and removing above ground facilities. The pipe would be cut at intervals to prevent inadvertent

transfer of groundwater from one area to another. The pipe would then be left in place to corrode.

Both decommissioning and abandonment have the potential for small scale temporary environmental impacts that will need to be carefully managed. Recovering the pipe from the ground is unlikely to be a commercially viable option and would result in significant and unnecessary environmental impacts.

Pipeline surface facilities would be similarly decommissioned as the above-ground components removed from site, allowing the surface to be rehabilitated to the existing surrounding land conditions.

The land, on which the assets were constructed, would be remediated and rehabilitated to a condition consistent with the surrounding area as far as practicable.

24.21.1 Preparatory Works

Preparatory works involve gathering necessary data for the detailed decommissioning and rehabilitation plan to be produced. These works may include, but are not limited to, the following:

- Preparing a detailed inventory of materials and equipment
- Carrying out environmental site assessment studies where required, which may include soil and groundwater analysis, to identify the presence of any potentially hazardous materials
- Undertake a formal decommissioning hazard identification (HAZID) process to finalise decommissioning and rehabilitation planning
- Preparing a final rehabilitation report (including a contaminated land assessment, landowner commitments/agreements and rehabilitation status) and a decommissioning plan, and submitting these to the appropriate authorities for approval.

24.21.2 Material and equipment removal and disposal

The decommissioning and rehabilitation methods will follow the waste management hierarchy for disposal of materials. Reuse is the preferred option, followed by recycling and, if unavoidable, then disposed to landfill or alternatively suitable regulated waste disposal facilities.

The material and equipment likely to be suitable for reuse includes mainline valves and scraper stations.

The material and equipment likely to be suitable for recycling includes steel, electrical equipment and cabling, control systems equipment and fencing

The material and equipment likely to be unsuitable for reuse or recycling includes plastic and glass, and any materials from pipelines and equipment. These would need to be properly disposed of to appropriate facilities.

24.21.3 Site rehabilitation, finishing earthworks and revegetation

When the above ground equipment and facilities have been removed, excavations and pits resulting from the decommissioning process would be backfilled and graded to the original contours. It will then be necessary to return the site to a condition consistent with the surrounding area as far as practicable, unless otherwise approved under the environmental authority. This would entail remediating and rehabilitating any contaminated areas, then grading and revegetating the site. The area, including access tracks, would then be spread with mulch and seeded with native vegetation.

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