

# ARROW BOWEN PIPELINE PROJECT

## EXECUTIVE SUMMARY



  
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MARCH 2012

VERSION	PURPOSE OF DOCUMENT	ORIG	REVIEW	REVIEW DATE	QAREVIEW	SKM RELEASE APPROVAL	ISSUE DATE
0	Final for DERM Review	DW/BR	GLM/LR	8/02/2012	DT	8/02/2012	8/02/2012
1	For Public Comment	DW/BR	GLM/LR	28/02/2012	DT	28/02/2012	28/02/2012

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### Note

This document is an executive summary of the key findings of the Arrow Bowen Pipeline Project EIS and does not constitute the project EIS.

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# OUTLINE OF ENVIRONMENTAL IMPACT STATEMENT

The Environmental Impact Statement (EIS) for the Arrow Bowen Pipeline project (the project) consists of three Volumes.

## VOLUME 1 - EIS

Environmental Impact Statement Report

## VOLUME 2 - MAPS

**Mapsheet overview** - 1:50,000

**Mapsheet overview** - 1:100,000

**Mapsheet overview** - 1:250,000

**Map 1:** Overview

**Map 2:** Tenements

**Map Series 3:** Tenure of Land

**Map 4:** Topography

**Map 5:** Land Use Suitability and Classes

**Map Series 6:** Geology

**Map Series 7:** Soils

**Map Series 8:** Infrastructure

**Map Series 9:** Good Quality Agricultural Land

**Map Series 10:** Terrestrial Flora

**Map 11:** Terrestrial Fauna

**Map Series 12:** Line pipe distribution routes for DN1050 line pipe from Port of Mackay

**Map Series 13:** Line pipe distribution route for DN500 and DN400 line pipe from Port of Mackay

**Map Series 14:** Line pipe distribution routes from Port of Gladstone

**Map 15:** Water Basins

## VOLUME 3 PART 1 - APPENDICES

**Appendix A1.** Final Terms of Reference for this EIS

**Appendix A2.** Regulatory Approvals

**Appendix A3.** The Standard Criteria

**Appendix A4.** Specialist Studies

**Appendix A4.1** Economic Assessment

**Appendix A4.2** Social Impact Assessment

**Appendix A4.3** Environmental Assessment Report (Flora) for the Proposed Arrow Bowen Pipeline

## VOLUME 3 PART 2 - APPENDICES

**Appendix A4.4** Terrestrial Fauna Assessment

**Appendix A4.5** Traffic Impact Assessment

**Appendix A4.6** Initial Safety Management Study

## VOLUME 3 PART 3 - APPENDICES

**Appendix A4.7** Proposed Pipeline Alignment Travelogue

**Appendix A4.8** Real Property Descriptions

**Appendix A4.9** Water Availability Study

**Appendix A4.10** Soils Assessment Report

**Appendix A4.11** Geological Characteristics of the Project Area

**Appendix A4.12** Water Crossing Information for Arrow Bowen Pipeline

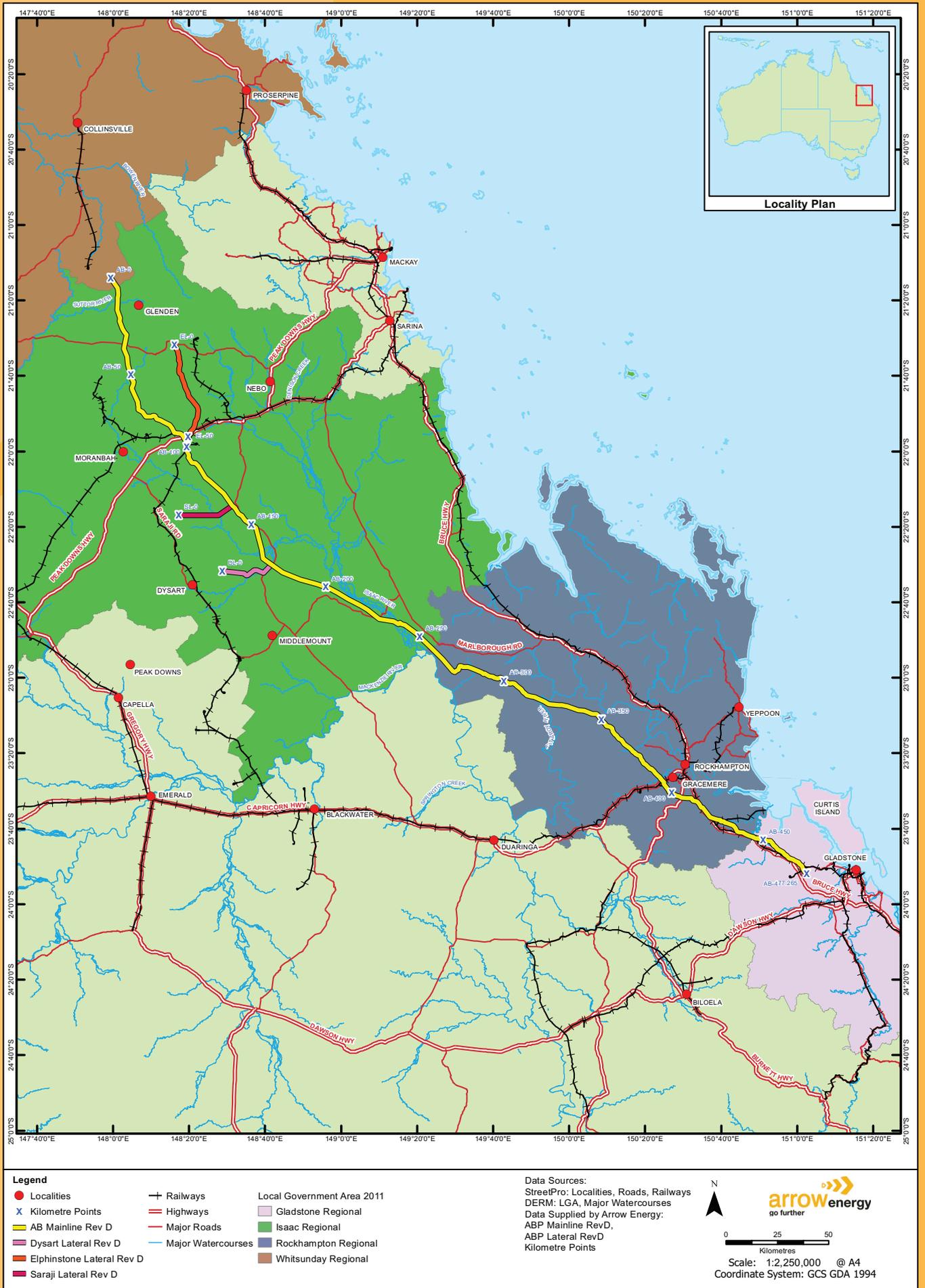
**Appendix A4.13** Aquatic Ecology Assessment

**Appendix A4.14** Flood Impact Assessment Study

**Appendix A4.15** Cultural Heritage Impact Assessment

**Appendix A5.** Research

**Appendix A6.** Study Team



Arrow Bowen Pipeline Preliminary Route

## ACKNOWLEDGEMENTS

The EIS has been prepared by Sinclair Knight Merz (SKM) Pty Ltd in conjunction with Arrow Bowen Pipeline Pty Ltd (Arrow) and specialist environmental and technical sub-consultants for the project. In preparing the EIS, the project team has relied on information provided by specialist consultants, government agencies and other third parties who are identified throughout the EIS.

### Specialist technical contributions include:

- > Economic Assessment by Sinclair Knight Merz Pty Ltd;
- > Social Impact Assessment by Sinclair Knight Merz Pty Ltd;
- > Terrestrial Flora Assessment by AECOM Australia Pty Ltd;
- > Terrestrial Fauna Assessment by Ecological Survey and Management Pty Ltd;
- > Initial Site Safety Management Study by GHD Pty Ltd;
- > Pipeline Route Selection Report by Coffey Environments Australia Pty Ltd;
- > Traffic Impact Assessment by GHD Pty Ltd;
- > Soils Assessment Report by Sinclair Knight Merz Pty Ltd;
- > Water Crossing Information by AECOM Australia Pty Ltd;
- > Aquatic Fauna Assessment by Sinclair Knight Merz Pty Ltd and Austral Consulting Pty Ltd;
- > Flood Assessment by GHD Pty Ltd;
- > Water Availability Study by GHD Pty Ltd;
- > Cultural Heritage Impact Assessment by Central Queensland Cultural Heritage Management Pty Ltd;
- > Historical Heritage Management Plan by Central Queensland Cultural Heritage Management Pty Ltd; and
- > Independent technical reviews by OSD Pipelines Pty Ltd.

## EIS DISPLAY AND PUBLIC COMMENT

A person has the right to make a submission on this project to the chief executive of the Department of Environment and Resource Management (DERM) within the stated submission period. The chief executive will accept a submission pursuant to section 55 of the *Environmental Protection Act 1994* (EP Act) if it:

- > is written
- > is signed by or for each person (signatory) who made the submission
- > states the name and address of each signatory
- > is made to the chief executive
- > is received on or before the last day of the submission period.

The EIS has been publically notified and the chief executive of DERM has allowed a 30 business day period for acceptance of public submissions on the EIS. All submissions, comments and enquiries regarding this EIS process should be addressed to:

The Chief Executive  
Statewide Impact Assessments  
Department of Environment and Resource Management

**Attention:** The EIS Coordinator (Arrow Bowen Pipeline Project) Floor 3,  
400 George Street, Brisbane, Qld, 4000  
GPO Box 2454, Brisbane, Qld, 4001

**Telephone:** 13 74 68 (13GOV)

**Facsimile:** (07) 3330 5754

**Email:** eis@derm.qld.gov.au

The chief executive of DERM may require the Proponent to prepare responses to properly made submissions on the EIS.

Members of the public may view the EIS documents during the submission period on the Arrow Energy web site or at the following locations during business hours.

[www.arrowenergy.com/page/Projects/Arrow\\_Bowen\\_Pipeline](http://www.arrowenergy.com/page/Projects/Arrow_Bowen_Pipeline)

<b>Department of Environment and Resource Management</b>	Floor 3, 400 George Street	BRISBANE	Qld	4000
<b>Moranbah Library</b>	Grosvenor Complex	MORANBAH	Qld	4744
<b>Emerald Library</b>	44 Borilla Street	EMERALD	Qld	4720
<b>Dysart Library</b>	Shannon Crescent	DYSART	Qld	4745
<b>Nebo Library</b>	10 Reynolds Street	NEBO	Qld	4742
<b>Rockhampton Regional Council</b>	232 Bolsover Street	ROCKHAMPTON	Qld	4700
<b>Gladstone Regional Council</b>	101 Goonoon Street	GLADSTONE	Qld	4680
<b>Whitsunday Regional Council</b>	83-85 Main Street	PROSERPINE	Qld	4800



## ARROW BOWEN PIPELINE PROJECT

The Executive Summary highlights key findings of the Environmental Impact Assessment undertaken for the project and provides an overview of the purpose of the EIS.

Arrow Bowen Pipeline Pty Ltd (Arrow) is the proponent for the project. The project consists of a 580 km pipeline (including a mainline and three laterals), above ground facilities, temporary workers' accommodation camps and temporary support facilities. The purpose of the project is to deliver Coal Seam Gas (CSG) from Arrow Energy's gas fields in the Bowen Basin (Central Queensland) to a proposed Arrow Energy Gladstone Gas Hub (GGH) in the Aldoga precinct of the Gladstone State Development Area (GSDA) for further transmission to Arrow Energy's proposed Arrow Liquefied Natural Gas (LNG) Plant on Curtis Island.

It is expected that completion of the EIS process and award of the pipeline licence for the project will be undertaken prior to the Final Investment Decision (FID) currently estimated to be taken by Arrow Energy on the upstream field development, pipeline and the proposed Arrow LNG Plant in late 2013.

Development of the upstream field development and the Arrow LNG Plant are subject to separate approval processes by other proponents and are not part of this EIS.

### **The Environmental Impact Assessment undertaken for the project and subsequent development of the EIS were undertaken to:**

- > Identify the existing environment of the project area;
- > Assess potential environmental, social and economic impacts of the project on the existing environment;
- > Outline suitable mitigation measures to reduce or avoid any potential adverse impacts identified; and
- > Identify a number of commitments that will enhance the environmental, social and economic benefits of the project.

The EIS was developed in consultation with government and community stakeholders.

The EIS concludes that, with appropriate mitigation measures, the project can be completed in a manner that minimises environmental and social impacts to a level that is acceptable to the community, while providing considerable economic benefits to the immediate project area, and the state and national economies.

The pipeline will be licensed by the Department of Employment, Economic Development and Innovation (DEEDI) under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act). An Environmental Authority (EA) under the *Environment Protection Act 1994* (EP Act) will be required from DERM for a Level 1, Chapter 5A Activity, defined in Schedule 5 of the *Environmental Protection Regulation 2008* (EP Regulation) as "constructing a new pipeline of more than 150 km under a petroleum authority."

The EIS will be used to support the pipeline licence application and application for a Level 1 EA and other environmental and development approvals.

## PROJECT PROPONENT

The project proponent is Arrow Bowen Pipeline Pty Ltd (Arrow), a wholly owned subsidiary of Arrow Energy Pty Ltd (Arrow Energy) which is a wholly owned subsidiary of Arrow Energy Holdings Pty Ltd (the Parent Company). Arrow Energy is a leading Australian based integrated energy company with its primary business activities focused on the exploration, appraisal and development of CSG, a cleaner burning fuel commonly used for electricity generation. Arrow Energy and its related companies and through various joint ventures currently operates, or is a major participant in, a number of gas production facilities and supporting infrastructure as well as power stations utilising CSG. The Parent Company is a wholly owned 50/50 joint venture held by subsidiaries of Royal Dutch Shell plc (Shell) and PetroChina Company Limited. Shell and PetroChina have an established history of working together on the development of energy projects and bring the technical capabilities, capital backing, major project experience and LNG marketing ability to accelerate Arrow Energy's business goals.

Shell has had a presence in Australia since 1901. Current operations include refining, sale of petroleum products and retail businesses. Shell maintains equity in the exploration and development of large gas resources off the coasts of Western Australia and the Northern Territory. As an internationally recognised leader in LNG production, Shell has delivered some of the world's largest and most complex LNG projects in the last 40 years, including facilities in Qatar, Nigeria, Russia and various projects throughout Southeast Asia. Through its subsidiary, Shell International Trading and Shipping Company Limited, Shell operates one of the largest LNG carrier fleets in the world.

PetroChina is a subsidiary of China's largest state-owned oil and gas producer and distributor, and one of the world's largest oil companies. PetroChina was incorporated as a joint stock company in 1999, as part of the restructuring of the China National Petroleum Corporation. PetroChina brings extensive experience in exploration, refining and marketing of oil and natural gas in China and other countries.

Arrow Energy and its related companies and joint venture arrangements has equity interest in more than 65,000 km<sup>2</sup> of petroleum tenures and CSG exploration tenements throughout Queensland and New South Wales with most of these within Queensland's Surat and Bowen basins.

Arrow Energy promotes sustainable environmental practices as part of its commitments, beliefs and values.

## PROJECT DESCRIPTION

### The project comprises the construction and operation of:

- > The Arrow Bowen (AB) mainline, which runs approximately 477 km from 18 km northwest of Glenden to a proposed Gladstone Gas Hub (GGH) to join the proposed Arrow Surat Pipeline (ASP) approximately 22 km west of Gladstone;
- > The Elphinstone Lateral (EL), which runs approximately 52 km from 25 km southeast of Glenden to the AB mainline, 29 km east of Moranbah;
- > The Saraji Lateral (SL), which runs approximately 26 km from 11 km east of the Peak Downs Mine to the AB mainline about 36 km east of the Peak Downs Mine;
- > The Dysart Lateral (DL), which runs approximately 26 km from 14 km northeast of Dysart to the AB mainline about 37 km northeast of Dysart;
- > Above ground facilities including main line valves, scraper stations, cathodic protection systems and the proposed GGH;
- > Temporary workers' accommodation camps; and
- > Temporary support facilities.

## PROJECT AREA

The project will commence approximately 90 km north of Moranbah in Central Queensland and terminate at the proposed Arrow Energy GGH approximately 22 km west of Gladstone where it will join the Arrow Surat Pipeline (ASP), formerly known as the Surat Gladstone Project (SGP), for further transmission to the proposed Arrow LNG Plant on Curtis Island.

The proposed pipeline route will commence in the southern part of the Whitsunday Regional Council Local Government Area (LGA), traverse the Isaac and Rockhampton Regional Council's LGAs in a southerly direction and terminate in the Gladstone Regional Council LGA. The proposed pipeline route also traverses land included within two State Development Areas (SDAs), being the Stanwell-Gladstone Infrastructure Corridor (SGIC) SDA and the Gladstone SDA (GSDA).

The proposed pipeline route traverses a number of petroleum production and exploration tenements within the Bowen Basin and is centrally located to Arrow's CSG reserves. The majority of land traversed by the proposed pipeline route is rural, much of which has been cleared for agricultural purposes, particularly grazing and cropping. The countryside is generally flat or undulating, crossed by waterways and marked occasionally by mountain ranges, hills, rocky outcrops, gullies and steep slopes.

The proposed pipeline route traverses the flat floodplain areas of the Isaac River before crossing the Broadsound Range where it follows a modified route of the proposed Gladstone Nickel Slurry Pipeline (Gladstone Pacific Nickel Ltd, formerly Marlborough Nickel Pty Ltd) along Marlborough Creek near Develin to near Midgee, south of Rockhampton.

The proposed pipeline route then enters the SGIC SDA declared by the Queensland Government for pipeline infrastructure between Stanwell and Mount Larcom and enters the GSDA and continues southeast to the GGH in the Aldoga precinct.



> Proposed Isaac River crossing point

## PROJECT OBJECTIVES AND SCOPE

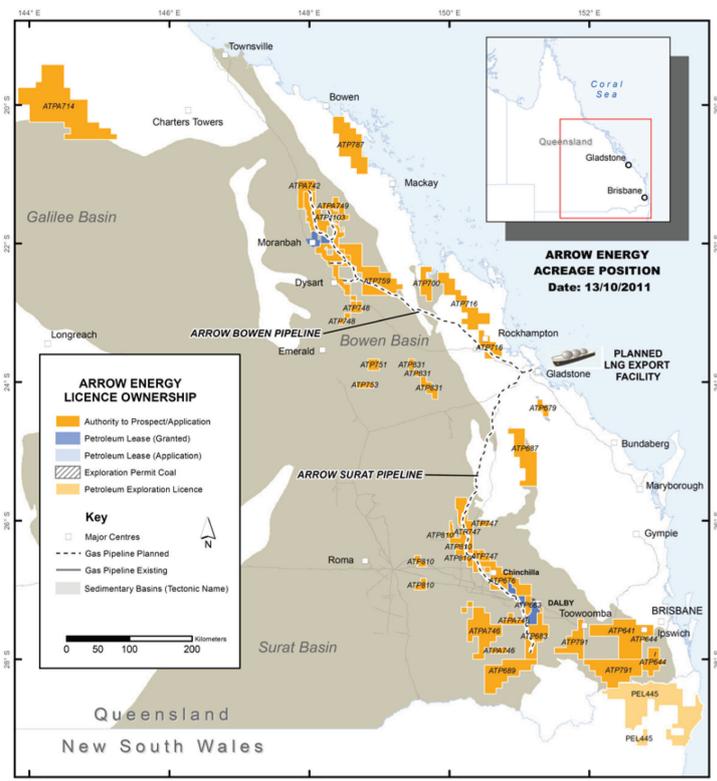
There is an increasing local, national and global demand for cleaner, carbon-efficient energy. Arrow Energy is a leader in CSG development in Queensland, and the project forms part of Arrow Energy's commitment to deliver gas to the export market by:

- > Developing Queensland's gas reserves and presenting a commercially-sound and reliable investment for the export economy;
- > Developing identified opportunities in the export LNG markets at a time when energy supply is in deficit and a continued growth in global demand anticipated;
- > Utilising a fuel source regarded internationally as a cleaner fuel source with lower greenhouse gas emissions compared to other fossil fuels;
- > Strengthening both Queensland's and Arrow Energy's position as leaders in CSG development in Australia and globally; and
- > Increasing Arrow Energy's business value through commercialising CSG reserves held in Arrow Energy's petroleum tenures for local and LNG export markets.

The project forms a key link in Arrow Energy's long-term strategy of creating a CSG pipeline network connecting Arrow Energy's upstream reserves with market opportunities, comprising the project and the ASP to the existing North Queensland Gas Pipeline. The pipeline network will connect Arrow Energy's gas fields in the Surat and Bowen basins to their customers and power stations at Daandine and Braemar in the Surat, the proposed Arrow LNG Plant in Gladstone, and through a connection to be developed in the future, to customers in Moranbah as well as customers and the power station at Townsville.

**The objectives of the project include:**

- > Contributing towards meeting growing global demand for LNG;
- > Consolidating Australia's reputation as a reliable producer of quality LNG;
- > Providing a cleaner alternative source of energy for industry, including power generation;
- > Assisting to insulate the Australian and Queensland economies against adverse international trends;
- > Adding to Queensland's long term infrastructure inventory;
- > Assisting Queensland to develop a new and lucrative export industry;
- > Further diversifying Queensland's energy industry away from greenhouse-intensive fossil fuels;
- > Progressing development of Queensland's CSG industry;
- > Continuing Queensland's entry into the expanding LNG industry; and
- > Providing market opportunities for Arrow Energy's CSG reserves in the Bowen Basin.



Arrow Energy Acreage Position

“  
**ARROW ENERGY IS  
 A LEADER IN CSG  
 DEVELOPMENT IN  
 QUEENSLAND**  
 ”



Overall, the project will help achieve increased competition in the gas supply market, greater potential export markets and direct economic benefit from construction expenditure and longer-term benefits of the project operation.

**The project is expected to provide a number of economic benefits to the Mackay and Fitzroy regions including:**

- > Contributing to increased output in the project area resulting in local and regional economic growth;
- > Contributing to increased household income through potential increase in consumption and potential increase in savings and investment;
- > Contributing to employment, particularly in construction;
- > Generating a total project income of \$128 million in the project area; and
- > Indirectly injecting close to \$2.9 billion into the Australian economy, with one-fifth of the total output impact expected to accrue to the project area.

**When completed, the project will produce many short and longer-term benefits including:**

- > Adding strength and diversity to Queensland's economic base and provide significant royalty and other revenue for the Queensland and Australian governments;
- > Assisting in insulating the Australian and Queensland economies against adverse international trends;
- > Further developing LNG export markets at a time when energy supply is in deficit and a continued growth in global demand is anticipated;
- > Strengthening Queensland's position as leaders in CSG development in Australia and globally; and
- > Providing Queensland with the opportunity to look for cleaner energy sources to replace coal-fired electricity generation.

## PROJECT SCHEDULE

At this stage, Arrow proposes to award the contract for construction of the project in 2014/2015 as part of the overall Arrow Energy transmission pipeline tender.

The project is currently scheduled to be constructed over 15 months, beginning in April 2016 and spread over the 2016 and 2017 dry seasons. At this stage, it is anticipated that operation of the project will commence in 2017.

Current expectations are that completion of the EIS process and award of the contract for construction will be undertaken prior to the FID (estimated late 2013) to be taken by Arrow Energy on the upstream field development, pipeline and the Arrow LNG Plant. Separate EIS processes are being undertaken for the upstream field development and the Arrow LNG Plant. It is anticipated that detailed design for the project will be completed following FID and prior to construction commencing.

## ENVIRONMENTAL IMPACT STATEMENT PROCESS

The Chief Executive for DERM is responsible for the coordination of environmental impact assessments when an EIS is required under the EP Act for petroleum activities.

Pursuant to the EP Act, an Initial Advice Statement (IAS) describing the project and application for the preparation of a voluntary EIS was prepared and submitted to the Chief Executive of DERM on 16 February 2011. The IAS was based on a desktop assessment of the project area.

DERM assessed the application to prepare a voluntary EIS and notified Arrow on 23 February 2011 that approval had been granted. In accordance with Section 41 of the EP Act, Arrow prepared a draft Terms of Reference (TOR) to commence the EIS process for the project, which was submitted to the Chief Executive of DERM on 24 February 2011. DERM subsequently issued the final TOR, which forms the basis of the EIS, on 7 July 2011.

As a central part of the EIS process, the public are invited to review the EIS and provide comment. Submissions can be made in writing for a specified period as per the public notice, which will be advertised in regional and state newspapers. A period of advertising, as well as public display and information sessions, to which interested and affected parties will be invited, will be held at various locations e.g. Moranbah, Middlemount, Dysart, Rockhampton and Gladstone. The schedule for the information sessions and the availability of the EIS will be advertised in the press.



**GENERATING A TOTAL PROJECT INCOME OF \$128 MILLION IN THE PROJECT AREA**



## OBJECTIVES OF THE EIS

The EIS is a public document and is Arrow's formal response to the TOR issued by DERM for the project. It is the key environmental submission providing advice to decision makers considering approvals for the project pursuant to the EP Act.

### The key objectives of the EIS are to:

- > Provide public information on the need for the project and its likely environmental, economic and social impacts and benefits;
- > Set out acceptable standards and levels of impacts (both beneficial and adverse) on environmental and socio-economic values;
- > Demonstrate how environmental impacts can be managed through the protection and enhancement of the environmental and socio-economic values;
- > Demonstrate the relationship to the project of environmental management, planning documentation, conditions, approvals and environmental and socio-economic authorities;
- > Outline the project alternatives considered and the likely environmental outcomes; and
- > Provide a draft Environmental Management Plan (EMP) and list project commitments.

As a central part of the EIS process, the public is invited to read the EIS and make comment on it. This will assist in determining Arrow's application for an EA for the project, and deciding any conditions attached to that authority.

## PUBLIC CONSULTATION

Undertaking appropriate and effective stakeholder consultation is an essential element of the project. Arrow has developed a Stakeholder Consultation Plan (SCP), which clearly states the stakeholder and community engagement goals, processes and outcomes, and how these will be achieved in a timely and effective manner. A Social Impact Management Plan (SIMP) has been drafted to promote an active and ongoing role for impacted communities and local authorities throughout the project lifecycle. In accordance with the SCP, Arrow has undertaken consultation with a range of stakeholders for the project, including affected landholders, government agencies and local government.

### The objectives of the SCP are to:

- > Identify project stakeholders, their needs and their values;
- > Identify the key stakeholder issues to be addressed during consultation;
- > Facilitate involvement with the community through a two-way flow of information between the project team and the public;
- > Actively encourage community input in an atmosphere of cooperation, support and encouragement;
- > Provide information on the EIS process;
- > Seek input on key issues and concerns and suggestions to mitigate these concerns;
- > Provide information on the outcomes of studies undertaken;
- > Demonstrate that possible issues of concern to the community have been identified and considered during the EIS process;
- > Ensure the community is informed about the project's goals and economic benefits;
- > Maintain an open channel of communication with stakeholders; and
- > Create an environment in which stakeholders and the public are more likely to support than oppose the project.



> Community and stakeholder consultation is an important element of the Project

## PROJECT APPROVALS

The project will be licensed under the P&G Act and an EA under the EP Act will be required from DERM for a Level 1 Chapter 5A Activity prior to pipeline construction and commissioning. The relevant Level 1 Activity is for 'constructing a new pipeline of more than 150 km under a petroleum authority.'

A number of additional approvals will be required following DERM's assessment of the EIS and the grant of the Petroleum Pipeline Licence (PPL) by DEEDI. These will be obtained at a later date once full details of their construction and operation are known. Applications for Development Approvals (for incidental activities outside the PPL area e.g. workers' camps) will be made under the Integrated Development Assessment System (IDAS) pursuant to the *Sustainable Planning Act 2009* (SP Act).

### Commonwealth Approvals

#### ***Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)***

The EPBC Act applies to those actions which are likely to have a significant impact on Matters of National Environmental Significance (MNES).

Arrow will refer the project to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPAC) for determination as to whether it constitutes a 'controlled action' under the EPBC Act. This decision will be made with consideration of the project's potential to significantly impact matters of MNES. A 'controlled action' requires formal assessment and approval. The processing of the EIS under Queensland State legislation is not intended to act as an assessment for the EPBC Act purposes under the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland.

#### ***Native Title Act 1993***

The native title process will be undertaken in accordance with the legislative requirements of the *Native Title Act 1993* (NT Act), and with native title claimants and regulatory agencies over lands for which native title has not been extinguished.

Arrow intends to develop Indigenous Land Use Agreements (ILUAs) with relevant native title parties along the pipeline route. Work on these respective ILUAs is well advanced.

#### ***Aboriginal and Torres Strait Island Heritage Protection Act 1984***

Cultural Heritage Management Plans (CHMPs) will be contained in the relevant ILUAs or be developed separately for approval by DERM to satisfactorily address the cultural heritage interests of the relevant Aboriginal Endorsed Parties along the proposed pipeline route. It is considered that the ILUA / CHMP will be sufficient to comply with this Act and the NT Act as well as applicable State government cultural heritage legislation.

### Queensland Government Approvals

#### ***Petroleum and Gas (Protection and Safety) Act 2004***

Arrow has an approved EA (PEN201616610) and a Petroleum Survey Licence (PSL) (PSL 64) from DERM and DEEDI respectively pursuant to Chapter 4, Part 1 of the P&G Act. PSL 64 provides land access, enabling field assessments to be undertaken for ecological and cultural heritage surveys and engineering and construction inspections, particularly to refine pipeline route selection. Under the P&G Act a point-to-point PPL authorising the construction and operation of the pipeline (including all connected facilities e.g. valve, scraper and meter stations) will be required from the Minister of DEEDI. Similar to a PSL, an EA is required from DERM before the PPL can be issued.

#### ***Environmental Protection Act 1994***

The EIS has been prepared pursuant to the EP Act which regulates impacts on Queensland's environment. Arrow has prepared this voluntary EIS for assessment by the Chief Executive of DERM.

Petroleum activities are classified within two levels of ERAs based on the risk of environmental harm from released contaminants. Under the EP Act, construction of a new transmission pipeline longer than 150 km is classified as a Level 1 petroleum activity. To undertake a Level 1 petroleum activity, an EA must be issued by DERM.

An EA is required to be granted and issued by DERM before a PPL can be granted by DEEDI. As part of the EA application, a detailed report and an EMP will be developed and submitted. The EMP will outline the general environmental and social aspects of the project (including associated facilities and temporary workers' accommodation camps) and sets environmental protection commitments for construction and operation of ABP.

Other State legislation associated with the activities described in the EIS with which the project will need to comply, includes:

- > *Aboriginal Cultural Heritage Act 2003;*
- > *Coastal Protection and Management Act 1995;*
- > *Electricity Act 1994;*
- > *Fisheries Act 1994;*
- > *Forestry Act 1959;*
- > *Land Act 1994;*
- > *Land Protection (Pest and Stock Route Management) Act 2002;*
- > *Nature Conservation Act 1992;*
- > *Queensland Heritage Act 1992;*
- > *State Development and Public Works Organisation Act 1971;*
- > *Sustainable Planning Act 2009;*
- > *Transport Infrastructure Act 1994;*
- > *Transport Planning and Coordination Act 1994;*
- > *Transport Operations (Road Use Management) Act 1995;*
- > *Vegetation Management Act 1999; and*
- > *Water Act 2000.*



## PROJECT NEED AND JUSTIFICATION

The primary objective of transporting CSG from the Bowen Basin to Gladstone economically and at volumes sufficient to feed the Arrow LNG Plant requires a large diameter dedicated pipeline or a shared pipeline. The project forms a key link in Arrow Energy's long term strategy of creating a CSG north to south pipeline network connecting Arrow Energy's gas fields in the Surat and Bowen basins to their customers and power stations at Daandine and Braemar, the proposed Arrow LNG Plant on Curtis Island, customers in Moranbah as well as customers and the power station at Townsville.

Although other pipelines are proposed within the project area e.g. Central Queensland Pipeline (CQP), no suitable pipeline currently exists or is likely to be constructed ahead of the project to bring gas from the Bowen Basin to Gladstone to ensure reliability of supply to the proposed Arrow LNG Plant on Curtis Island.

### Proceeding with the project would realise many benefits including:

- > Further development of LNG export markets and strengthening Queensland's position as leaders in CSG development in Australia at a time when energy supply is in deficit and a continued growth in global demand is anticipated;
- > Adding strength and diversity to Queensland's economic base and providing significant royalty and other revenue for the Queensland and Australian governments;
- > Providing Queensland with the opportunity to look for cleaner energy sources to replace coal-fired electricity generation;
- > Providing a number of direct and indirect economic and social benefits to local and regional communities in the project area such as:
  - increased output in the project area resulting in local and regional economic growth;
  - contribution to employment, particularly in construction and operational jobs;
  - opportunity to source workers locally and for local businesses to supply goods and services to the project;
  - opportunities for existing employees to develop additional skills and undertake training during all phases of the project; and
  - opportunities for indigenous workers, apprentices, trainees or cadets to develop additional skills.

Overall, the project will help achieve increased competition in the gas supply market, greater potential export markets and direct economic benefit from construction expenditure and longer term benefits of the project operation.

## PROJECT ALTERNATIVES

### Development of the Central Queensland Gas Pipeline

Arrow Energy is currently a 50/50 joint venture holder with AGL Energy Ltd of the proposed Central Queensland Pipeline (CQP, PPL121) which has not yet been constructed. The CQP involves the construction and operation of a 440 km long high-pressure gas transmission pipeline in Central Queensland from Moranbah to Gladstone. The CQP would provide a strategic link for gas supply between North Bowen Basin and Gladstone. The CQP is however inadequate to transfer sufficient CSG to the proposed Arrow LNG Plant on Curtis Island and this pipeline is no longer considered suitable as a transmission pipeline for CSG from Arrow's tenements in the Bowen Basin for the following reasons:

- > Given the design capacity of the proposed Arrow LNG Plant, a considerably larger diameter pipeline than that proposed for CQP is required for the transmission of CSG from the Bowen Basin; and
- > Future coal mining expansion south east of Moranbah requires that at least the first 150 km of the CQP will need to be re-routed to ensure that valuable coal deposits are not sterilised.

### No project option

The consequences of not proceeding with the project would mean the non-realisation of the benefits which would be to the detriment of the local, regional, state and national economies. Increased competition in the gas supply market would not be achieved, potential export markets would not be reached and the direct economic benefit from construction expenditure and the longer-term benefits of the pipeline operation would be lost.

# ALTERNATE PIPELINE ROUTE OPTIONS

A number of alternate pipeline routes have been considered for the project. One of Arrow's objectives for the project, is to cost-effectively deliver CSG from Bowen Basin resources to the Arrow LNG Plant at Curtis Island for export to customers.

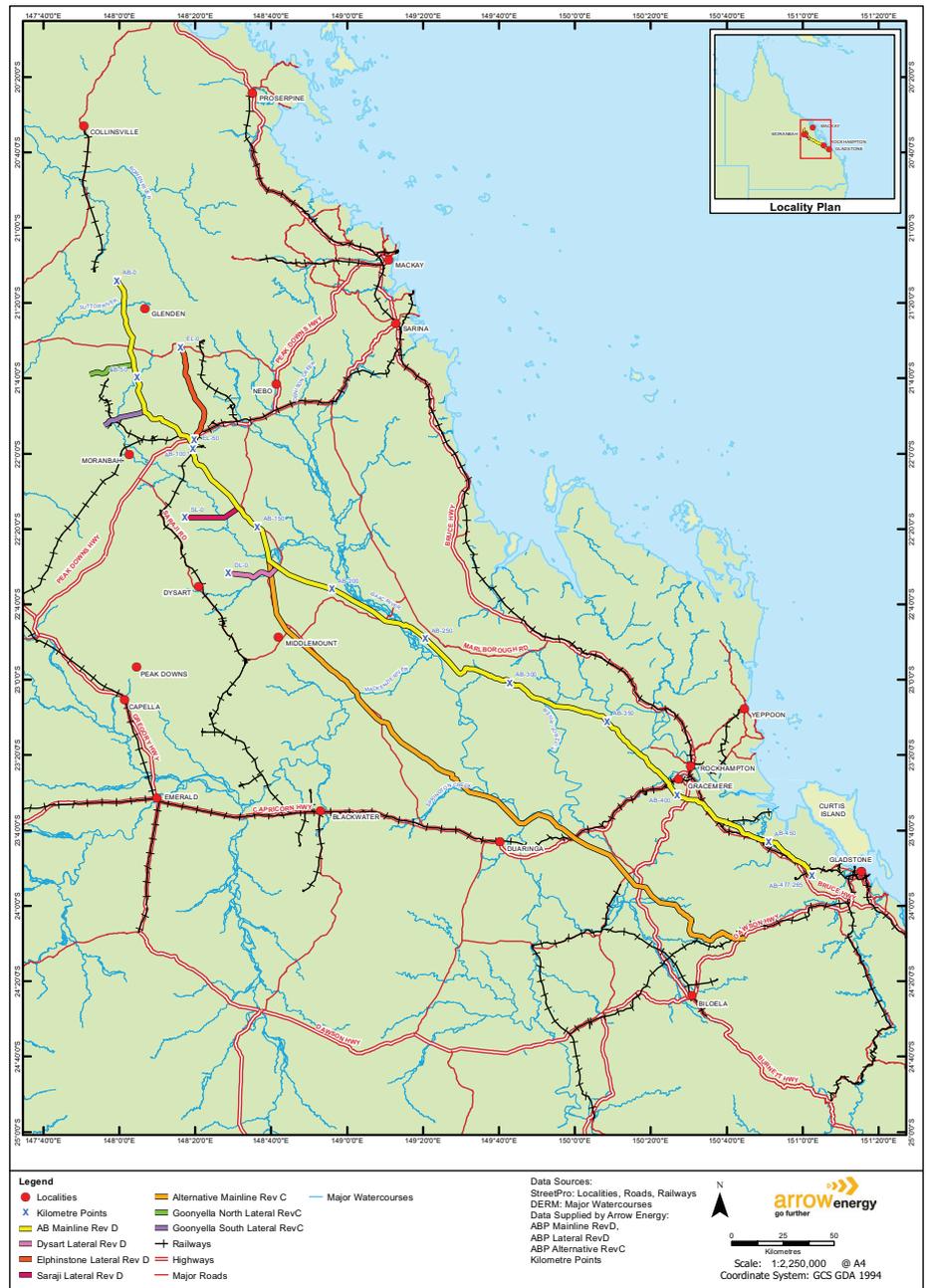
To deliver on this objective, the proposed pipeline route needs to be:

- > Located in a pipeline corridor that allows cost-effective construction while minimising impacts to the environment, landholders, local communities and mining interests;
- > Optimally configured to efficiently accommodate current capacity requirements while allowing for cost-effective expansion to meet future capacity requirements; and
- > Designed and constructed in compliance with relevant standards while achieving capital and operating cost efficiencies through innovation in design and construction.

The pipeline route options were based initially on a desktop assessment and refined by further studies and field investigations. Each alternate pipeline route commenced in the Bowen Basin, approximately 90 km north of Moranbah and consisted of a number of lateral pipeline options.

The proposed pipeline route takes a more direct route to Gladstone, whereas the southern alternate pipeline route travels from near Middlemount adjacent to the not yet constructed CQP route to the Mackenzie River where it deviates south to the Callide Range before joining the Callide Infrastructure Corridor where it will join the proposed ASP to Gladstone.

The alternative pipeline route is longer and faces a number of challenging construction limitations in traversing the difficult terrain of the Calliope Range. The alternative pipeline route has since been discounted due to higher construction costs and to avoid impacting endangered cycad populations naturally occurring in the Calliope Range.



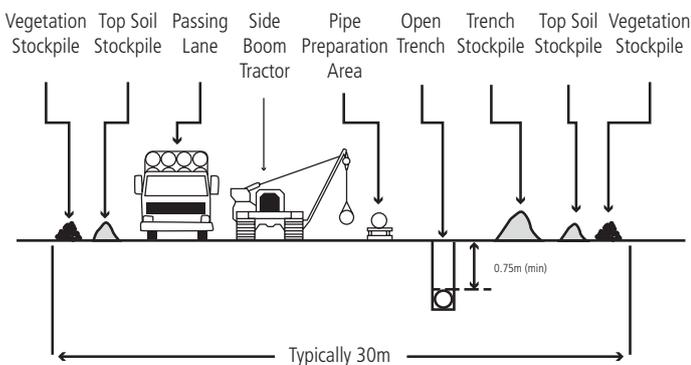
Alternative Pipeline Routes

## CONSTRUCTION

The proposed pipeline will be constructed in accordance with Australian Standard (AS) 2885 and the Australian Pipeline Industry Association Code of Environmental Practice - Onshore Pipelines (APIA, 2009). Construction will require a right of way (ROW) along the proposed pipeline route with a width of 30 m within which pipeline construction activities will occur. The ROW is essential to provide access along the proposed pipeline route for pipe, personnel and supplies to construct its works. Additional area will be required for access tracks, truck turnarounds, pipe and equipment laydown areas and temporary workers' accommodation camp sites.

The pipeline will be a buried steel gas transmission pipeline of up to 42 inch (DN1050, 1,050 mm) in nominal diameter.

It is envisaged that the pipeline will be constructed over 15 months, commencing in April 2016 and undertaken over the 2016 and 2017 dry seasons. It is proposed to award the contract for pipeline construction in 2014/2015. The contractor will have the responsibility for development of a detailed construction schedule that meets the completion deadline.



Source: APIA Code of Environmental Practice



› Pipeline welding

**The pipeline will comprise of lengths of coated steel pipe welded together. Construction will be typical of modern pipeline projects and will involve the following key steps:**

- › Establishment of temporary facilities such as work areas for equipment and pipe storage, campsites, worker accommodation and access tracks;
- › The pipe centreline will be surveyed and pegged ;
- › Installation of temporary gates and fences as required;
- › Clearing vegetation and grading the ROW to prepare a safe construction working area;
- › Separating and stockpiling topsoil and subsoil for reuse during rehabilitation;
- › Welding the pipe sections together to form 'strings' approximately 800 m in length;
- › Excavating a trench with the trench depth typically 2 m depending on the current or anticipated use of the land;
- › Lowering the pipeline string into the trench on top of padding (fine subsoil) at the base to protect the pipe coating from damage;
- › Returning the subsoil and topsoil to their original horizons;
- › Testing the integrity of the pipeline by filling it with water and pressurising (hydrostatic pressure testing) it to above the Maximum Allowable Operating Pressure (MAOP); and
- › Cleaning up, restoring and rehabilitating the ROW, access tracks and temporary workers' accommodation camp sites.

Clean up, restoration and rehabilitation measures will be applied to the ROW area disturbed during construction as soon as practical after pipe laying and backfill. Rehabilitation will be undertaken in accordance with best practice and will ensure that topsoil cover is re established and land is returned as close as possible to its previous productivity. Landforms and natural drainage patterns will be reinstated prior to fences and gates being restored and pipeline marker signs installed.

Clean up, restoration and rehabilitation measures will be applied to the additional areas including access tracks, truck turnarounds, pipe and equipment laydown areas and temporary workers' accommodation camp sites, as soon as practical after the ROW construction activities in the area have been completed.



## WATERCOURSE CROSSINGS

Watercourse crossings will be required for pipe laying and the movement of construction equipment.

### Common pipeline construction methods used for crossing of the watercourses include:

- > Open cut trenching (including flow diversion, if applicable);
- > Horizontal direction drilling (HDD).

The sensitivity of most of the watercourse crossings is considered Low to Moderate, with standard open cut (trenching) being considered for the majority of watercourse crossings. To minimise the period of construction and subsequent environmental disturbance, trenching for watercourse crossings will be undertaken within the shortest period practical. It is anticipated that construction will occur during the drier months when there is less rainfall and watercourses are usually at their lowest flow level. The majority of the watercourses crossed by the proposed pipeline are ephemeral, i.e. of intermittent flow following rain. If flowing water is present, it will be transferred across the trench using pipes, or the watercourse will be dammed and the water pumped around the crossing site.

Temporary causeways will be constructed across watercourses. Trench spoil removed from the watercourse will be placed above the bank. Trench and backfill activities will be undertaken to ensure that bed and bank material is stockpiled separately and returned to the trench to original conditions.

The pipe may be concrete coated to reduce buoyancy for watercourse crossings and in areas of significant inundation (such as flood-prone areas).

Welded pipe will be laid in the trench and spoil material returned to the trench. Rock protection may need to be placed over the trench in the stream bed where required, to prevent potential scouring during high water flow conditions.

Watercourse banks will be reinstated as near as practicable to their original profile. Geofabric (for example, jute matting), which remains permeable to water and enhances plant growth, will be used to hold soil in place during re-establishment where required.

Following construction, reinstatement will be monitored and access will be restricted to facilitate rehabilitation.

Permanent flowing watercourse crossings may be constructed using the HDD technique in which a hole is drilled under the watercourse bed and the pipeline section is pulled through the hole.

This technique is being considered for crossing the Fitzroy River, parts of the Isaac River and Raglan Creek. Because HDD is governed by site conditions, such as soil stability, slope, access, available workspace and nature of subsurface ground conditions, a detailed geotechnical investigation will be necessary to determine site suitability. HDD typically takes between a few days to several weeks per crossing.

A purpose-designed drill rig, operated by a specialist contractor, will be used. Once the pipe string is installed and tied into the main section of the pipeline, the entry and exit points are remediated.

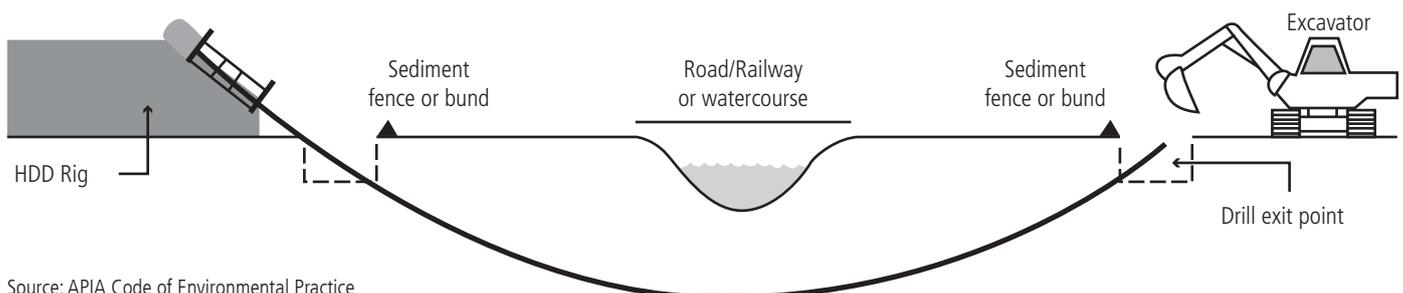
## ROAD AND OTHER INFRASTRUCTURE CROSSINGS

The Bruce, Peak Downs, Burnett and Capricorn Highways are among the more significant of infrastructure crossings along the pipeline route.

Minor roads and tracks will be crossed using open cut methods. Construction will be timed to minimise disruption to users. Crossings of sealed roads will be undertaken by utilising thrust boring beneath the road. Traffic and safety management procedures will be implemented during this work to ensure that users are aware of the activity and conditions are safe.

Seven railway lines (including one disused and one proposed) cross the proposed pipeline route. Rail crossings will generally be undertaken utilising a thrust boring technique or alternatively by HDD, depending on geotechnical investigations and approval of Queensland Rail (QR).

Thrust boring is a low impact technique, which may be used for crossing sealed roads and railway lines. It involves drilling short distances from below ground within an enlarged trench area located in the construction ROW area. The feasibility of a bore is limited by site conditions, including geology, landform and soil type, as well as depth and width of the crossing. Thrust bores are usually completed within one to five days per crossing.



Source: APIA Code of Environmental Practice

## ABOVE GROUND FACILITIES

Above ground structures will be situated at intervals along the proposed pipeline route and will include cathodic protection posts and main line valves, scraper stations and the GGH at the end of the proposed pipeline route. Typically, these facilities are located within the 30 m wide easement and will be protected by fencing. Pipeline marker signs are placed along the route in accordance with AS 2885.1.

## COMMISSIONING

Following completion of hydrostatic pressure testing, each section of the pipeline will be commissioned. Commissioning activities will be in accordance with a procedure prepared during the detailed design and construction phase of the project. This will involve:

- Forming a 'slug' of nitrogen to prevent mixing of CSG with the air in the pipeline;
- Low pressure CSG fill;
- Final high pressure fill to limit of gas availability; and
- Commissioning checks and performance tests.

The initial CSG fill will be preceded by the introduction of a slug of an inert gas, typically nitrogen and a number of foam pigs to separate the air present in the pipeline after construction and the CSG, thereby preventing the likelihood of a potential explosion due to any air / gas mixture.

During purging, air will be discharged from the downstream end of the section being commissioned (typically at a line valve) followed by the nitrogen slug and then CSG. As there may be some mixing of the slugs, the CSG initially contains some nitrogen. Venting will continue until pure CSG is detected at the outlet (valve), after which the section will be locked in and the pressure increased until the low level cap is reached.

Volumes of gas discharges at this time are very small as most of the discharge is at pressures just slightly above atmospheric pressure.

The low-pressure fill enables leak testing at low pressures to be undertaken prior to the pipeline reaching full line pressure.

At the completion of commissioning, the pipeline will have been purged and filled with gas to a pressure determined by the Commissioning Manager and be ready for operation.



➤ Typical enclosure around a valve on a rural property

## OPERATION

The operation of the pipeline will be in accordance with approval documentation, a specific operation EMP, AS 2885 and the APIA Code (APIA 2009).

The pipeline will be a high-integrity pipeline constructed from high strength steel and integrity tested by 100% non-destructive testing examination of welds and a high-pressure hydrostatic test at pressures in excess of the MAOP. Operational activities will ensure that this integrity is maintained over the life of the project.

During operation, a pipeline easement of 30 m will be maintained.

A routine operation and maintenance program will include leak detection surveys, ground and aerial patrols, pigging and cleaning of the proposed pipeline, corrosion monitoring and remediation, easement maintenance and identification of any potentially threatening third party activity. Aerial and/or ground inspections will monitor vegetation rehabilitation (including presence of weed species), erosion and/or subsidence of the ROW.

The pipeline pressure will be continuously monitored for any significant rate of change that could indicate a major leak. Pipeline valves on either side of the suspected leak location would close automatically on detection of an excessive rate of change in pressure allowing individual sections to be isolated for subsequent inspection and testing.

Prevention of damage due to third party activity will be achieved through appropriate depth of cover, signposting of the pipeline, one-call 'Dial Before You Dig' programs, continuous landholder and other stakeholder liaison, regular inspection of the pipeline easement to detect any construction or earthmoving activities in the area, and third party education on the potential dangers of carrying out excavation activities in proximity to the pipeline. Underground operational pipelines generally have minimal environmental or landholder impact.

In some areas, such as crossings, additional protection may be incorporated to reduce the risk of third party interference (e.g. marker tape buried above the pipeline, physical barriers or thicker wall pipe).

Heavy wall pipe, security fencing, gates and locks will be provided around all pressurised above ground facilities (e.g. valves) to protect against accidental damage or unauthorised tampering.

External pipeline corrosion will be prevented by an external protective coating and a cathodic protection system. As the pipeline is buried, land users will be able to resume previous land use activities over the pipeline easement. The only limitations generally will be with regard to excavation and building activities on the 30 m wide easement.

Access to the pipeline easement by the operator will be necessary to follow up issues identified from inspections. Ground inspection for erosion, subsidence and weeds will be undertaken, particularly during the first twelve months following commissioning and on-going throughout operations when necessary. The majority of the surveys will be conducted using aeroplanes or helicopters.

## WORKFORCE AND ACCOMMODATION

The project is anticipated to require a workforce of 693 people during construction, 10 people during commissioning and 15 people during operation.

Temporary workers' accommodation camps will be located along the proposed pipeline route for workers to live in during the construction phase of the project. Although there is an anticipated construction workforce of 693 people for the project, the temporary workers' accommodation camps will cater for approximately 400 people each, with two camps operational at any one time.

Five temporary workers' accommodation camp locations are expected to be required over the life of the project, however it is expected that generally only two camps will be operational at any one time. It is intended that the temporary workers' accommodation camps will be relocated close to the proposed pipeline route as the pipeline is being constructed. Each temporary workers' accommodation camp will provide for workers laying pipe for up to 50 km either side of the camp.

The temporary workers' accommodation camps are expected to be located at Red Hill, Daunia, Hillcrest, Foresthome and Bajool.

### The general location of each temporary workers' accommodation camp will be chosen having regard to:

- > Suitability of site: No environmentally significant species or cultural heritage significance present, suitability of soil for sewage effluent disposal and high expectations for successful rehabilitation;
- > Acceptance: Local government authority preparedness to issue development application to cover erection and landholder acceptance;
- > Access: the temporary workers' accommodation camp will require all-weather road access (for transport, food and water supplied, personnel access/egress, etc);
- > Proximity to the ROW: the temporary workers' accommodation camp will need to be located close to the ROW;
- > Separation from flood prone areas: the temporary workers' accommodation camp will need to be located outside of flood-prone areas; and
- > Separation from habitation: the temporary camps will be located away from towns and typically a minimum of 3 km from residences.

Each temporary workers' accommodation camp will be self-contained and will have its own power generation, sewage treatment and a potable water supply.

Approval for the temporary workers' accommodation camps will be sought by the principal construction contractor later in the planning and approval process under the IDAS.



## WATER SUPPLY

Water is required for a number of aspects of the project, with the main water requirements being:

- > Potable water for use within the temporary workers' accommodation camps and for personnel consumption. It is calculated that approximately 12.8 ML per camp (with a total of 64 ML for all five) will be required over the life of the project;
- > Non-potable water for construction activities including dust suppression, welding, joint coating, vegetation management and weed washdown purposes. It is calculated that approximately 150 ML will be required over the life of the project; and
- > Hydrostatic pressure testing water. Approximately 100 ML of non-potable water will be sourced from existing supplies along the route for hydrostatic testing.

There are no specific water demands for the operation of the project.

The transportation of already-treated water has been identified as the preferred approach to supplying the potable water demands of the camps as the other options are unlikely to be cost-effective. Consideration will be given to on-site treatment once the availability and ease of access to raw water supply is confirmed.

Non-potable water will be sourced from a combination of bores, turkey nest or other dams, watercourses and raw water supply pipelines. In sourcing water, consideration will be given to minimising cartage distances to limit cost, emissions, travel time and environmental impacts associated with vehicle movements.

Hydrostatic pressure testing requires large volumes of water to be pumped into the pipe before being pressurised, including water to flush the pipes prior to the testing. The flushing and cleaning stage of the pipeline construction involves flushing the pipeline with water and cleaning pigs prior to the hydrostatic testing.

Hydrostatic pressure testing will be undertaken in test sections with approximately 25 km of pipeline being filled with water at any one time, with the opportunity to transfer water from section to section several times before it becomes unusable or limited by other factors. This will reduce the total water requirements and assist in minimising the need to transport water to the test site.

Prior to the discharge of test water into the environment, it will be assessed and then discharged to an appropriate point depending on the water quality.

## TELECOMMUNICATIONS

The provision of temporary telecommunication systems will be required during the construction stage of the project. This will include fixed station satellite dishes at the temporary workers' accommodation camps and the installation of radios (UHF or VHF) in the construction vehicles.

The radio network will require installation of portable temporary repeater towers at intervals along the pipeline. Environmentally- or culturally-significant locations will be avoided. At the completion of construction, the temporary towers will be removed and site reinstatement works undertaken.

## DECOMMISSIONING

When, and if, the proposed pipeline is no longer required, it will be decommissioned in accordance with the legislative and regulatory requirements and accepted environmental best practices and standards applicable and relevant at that time. Currently, decommissioning procedures require the removal of all above ground infrastructure (including all scraper station plant, pipeline valves and metering stations) and the restoration of associated disturbed areas.

At the time of decommissioning, a decision will be made regarding the opportunities for future use of the pipeline. The following two options will be considered:

- > Moth-balling - this will involve depressurising the pipeline, capping and filling with an inert gas (such as nitrogen) or water with corrosion inhibiting chemicals. The cathodic protection system will be maintained to prevent the pipe corroding; and
- > Abandonment - this could involve purging the pipe of natural gas, disconnecting it from the manifolds and removing all above ground facilities. The pipe will then be filled with water and left to corrode in-situ. Removing the pipe from the ground is unlikely to be an environmentally- or commercially-viable option. A detailed rehabilitation program will be developed and implemented in consultation with landholders and the regulatory agencies at the time of abandonment.



› Natural Wildlife

## CLIMATE

The climate of the project area is predominantly sub-tropical, with temperatures varying from warm to hot in summer, to mild to cool in winter with large daily variations. The project area has limited vulnerability to climatic extremes, which include cyclones, floods, drought and fires. There is a potential risk from bushfires, severe storms and from periodic flooding associated with cyclone events. Local climate and extreme climatic events may temporarily impact on construction scheduling, but will not normally adversely affect the operation of the project in the long term.

**The findings of a preliminary climate change risk assessment show the project has limited vulnerability to climate change projections over the operational life of the pipeline. The climate change assessment identified a combination of mitigation and adaptation strategies to effectively manage and reduce the potential severity of impacts arising from seasonal changes, extreme climatic events and predicted climate changes on the natural environment, local residents and the construction workforce:**

- > Implement specific management strategies (e.g. soil erosion and sediment control, fire risk management, emergency response management) during construction and/or operation to minimise potential impacts from adverse climatic events;
- > Monitor local and regional weather forecasts and review the potential impact to the construction schedule; and
- > Consider the likelihood of extreme weather e.g. flooding in the location and design of above ground infrastructure.

## LAND

Ground elevations generally decrease from the west to east from a maximum elevation of 434 m Australian Height Datum (AHD) at Mount Ewan, near Glenden, to less than 5 m AHD at the Port Alma coastal plain, in the southeast section of the proposed pipeline route.

Geologically, the western part of the proposed pipeline route lies within the Carmila Beds Bowen Basin. The southeast section of the proposed pipeline route traverses a small part of the Gogango Overfold Zone and the Yarrol Province.

The Bowen Basin has been the subject of recent growth and major development as a result of coal and gas exploration, including CSG for LNG development. Consequently, the pipeline route passes through a number of petroleum production and exploration tenements. Exploration and resource tenure holders have been approached to determine the extent of the delineation as pipelines may constrain development of deeper coal seams.

The proposed pipeline traverses the Whitsunday, Isaac, Rockhampton and Gladstone Regional Council areas. Land use is regulated under each relevant local government planning scheme. The majority of land traversed by the proposed pipeline route (96.62%) is included in the rural land use class, much of which is used for farming enterprises such as broad acre cropping and grazing. Of this cropping and grazing land, the assessment has identified that Strategic Cropping Land (SCL) is not traversed by the proposed pipeline route and the majority of land traversed by the proposed pipeline route (86%) is Class C Good Quality Agricultural Land (GQAL) which is suitable only for improved or native pastures.

Pipeline construction will result in short-duration limitations on land use within the ROW and additional areas. Although GQAL will be avoided wherever possible, the preferred pipeline route will inevitably pass through



› Aerial view along the proposed pipeline route



some lands classified as GQAL as a result of areas currently under cultivation, site specific characteristics and the necessity to avoid vegetation communities of high conservation value. However, impacts are expected to be limited and of short duration as they only occur during pipeline construction.

The pipeline is also not expected to impact on GQAL during operation as the disturbed area from construction will be rehabilitated as quickly as possible and returned to its original land use.

119 residential dwellings have been identified within a 1 km buffer either side of the proposed pipeline route (with only two residences located within 100 m of the proposed pipeline). While there may be temporary impacts on residential dwellings during construction of the project (e.g. transport, air, noise, and visual amenity) such impacts are expected to be minimal due to the temporary nature of construction. Construction of the project will be progressed sequentially, with clean-up, restoration and rehabilitation initiated as soon as practical after backfilling is complete, while trenching and the other activities are advanced.

The majority of the proposed pipeline traverses land that has a medium potential for erosion. Areas of high hillslope erosion potential (>10 t/ha/yr) are identified and generally correspond to steeper hilly sections of the proposed pipeline route primarily through the Broadsound Range. Areas of high slope have a high potential for erosion if appropriate erosion management strategies are not effectively implemented. Erosion potential and stability will be analysed during detailed geotechnical surveys to determine the suitability of the proposed locations and to determine appropriate management measures, primarily incorporating cut-off drains to divert stormwater flows away from the rehabilitated ROW. Erosion and Sediment Control measures will be marked on the alignment sheets for the pipeline construction. Monitoring of the rehabilitated ROW will be maintained to ensure erosion and sediment control measures to prevent scour, particularly in areas of high slope remain effective.

No acid sulphate soil (ASS) is mapped for the length of the proposed pipeline route however further investigation may be required during detailed design phase to assess the potential for presence of ASS in the vicinity of Inkerman Creek and Raglan Creek.

## TRANSPORT

The volume and intensity of vehicle movements will vary over the 15 month construction period depending on the stage of construction. Short term increases in traffic volumes on the road network and their duration have been determined. Based on the nominal capacity of the road network, the additional traffic due to the project can be adequately accommodated at acceptable levels of service. The communities affected will be kept informed of progress and safeguards implemented.

### Traffic generated during the construction phase will mainly be from equipment and material deliveries, including:

- > Movement of construction personnel and specialist supervisory personnel;
- > Minor construction materials and consumables;
- > Line pipe supply distribution; and
- > Construction plant and equipment.

It is estimated that approximately 21 buses, 56 station wagons, 100 utilities and 14 twin cabs will be used for travel associated with personnel movements from the temporary workers' accommodation camp sites to the ROW. Vehicles will travel on main roads, local roads and the ROW.

It is anticipated that approximately 20 vehicles will be used to service the project for deliveries of fuel, water, materials and other consumables to locations along the proposed pipeline route during construction. These vehicles will use the local road network between the temporary workers' accommodation camps and the proposed pipeline route and will generally travel along the ROW.

Haulage of materials and plant will be a seven day-per-week operation. The line pipe will be delivered to the ROW from the main feeder roads via the local road network.

Unloading the line pipe at the ROW will be limited to daylight hours, so the timing of the round trip for pipeline deliveries will depend on when trucks can be unloaded. The current logistics strategy estimates that a total of approximately 192,800 tonnes (t) of line pipe will be delivered from the Port of Mackay and 61,800 t of line pipe from the Port of Gladstone.

It is anticipated that a total of 46 truck loads per day per direction (92 movements in both directions) will be required for the delivery of the line pipe to the ROW or to a proposed stockpile near Nebo from Port of Mackay. An additional 32 truck loads per day will be required to deliver line pipe from the Port of Gladstone.

Since the bulk of additional traffic movements on the State Controlled Roads (SCR) network will be attributed to the delivery and distribution of line pipe, the additional traffic generated will be approximately 52 vehicles per day. Whilst it is expected that traffic generated by movements of workers, construction materials and supervisory personnel will mainly be accessing the construction site through the local road network, this will be only over very short distances, as the camps are to be located near to the ROW, and for a short duration as construction activities move along the ROW.

Use of the SCR network will not be regular and the additional traffic volumes will be minor. The delivery of materials and equipment will be spread over the construction period of 15 months and the movement of vehicles will be managed to minimise impacts on the local community.

Most of the construction activity will be confined to the project area and traffic movements along the SCR network will be managed by the implementation of an appropriate Traffic Management Plan which will be developed in consultation with the relevant Department of Transport and Main Roads (DTMR) regions,



## WASTE MANAGEMENT

It is predicted that relatively small amounts of domestic and general construction wastes will be generated during the construction and operation of the proposed pipeline.

Wastes will be segregated and consolidated in applicable waste categories and transported from the project area for recycling or disposal by a licensed waste contractor.

There will be very little excess excavated spoil during construction of the pipeline. All suitable material excavated during trenching will be re-used in the trench as padding or backfill for the pipeline. Some areas containing rock may require the rock spoil to be crushed prior to return to the trench as padding. Any excess spoil not able to be returned to the trench will be disposed at a site as agreed with the landholder.

Chemical wastes e.g. oils and lubricants will be collected and appropriately labelled for safe transportation to an approved chemical waste depot or collection by a liquid waste treatment service.

Any vegetation waste created through clearing activities will be placed in windrows along the ROW, chipped or used for rehabilitation/restoration purposes along the ROW.

A packaged sewage treatment plant (STP) with sufficient capacity to produce treated wastewater of appropriate quality for land irrigation will be installed at each temporary workers' accommodation site.

Most of the daily water consumption of 200 kL will be from the kitchen, laundry and ablution facilities and will be treated through the STP.

The volume of water used to hydrostatically pressure test the pipeline has been calculated as up to 25 ML per 25 km test section. Approximately 1 ML of this water will be discharged at the end of each test section after use as a flushing and cleaning 'slug'. The total volume of hydrotest water over the length of the proposed pipeline route has been estimated to be 100 ML as there is an opportunity for re-use. The water will be piped into a lined temporary evaporation pond and any residues removed with other industrial waste or treated and discharged to land in line with licence conditions.

## WATER

The proposed pipeline route will cross a number of perennial, seasonal and intermittent watercourses including rivers, streams, floodplains and wetlands. Three river basins, the Burdekin, Fitzroy and Calliope basins are traversed. The majority of the proposed pipeline route is contained within the Fitzroy Basin, which is the largest Basin in Queensland and drains via the Fitzroy River to the eastern seaboard through the City of Rockhampton.

A total of 53 watercourses were assessed along the proposed pipeline route with many typical of Australian inland waters, being intermittent with little to no flow during the drier months. Most of these watercourses have maximum flows in January and February, with the lowest flows in August and September.

Of the significant watercourses surveyed, 12 of the crossing locations were found to be perennial and are considered to be regionally significant. The majority of watercourses assessed contained no or limited water at the time of the surveys.

The Fitzroy River is the largest river system crossed by the proposed pipeline route with other significant crossings including the Isaac River and Raglan Creek. Additionally, waterholes are present at numerous watercourse crossings. Waterholes at Ungle, Black Gin Creek, Larcom Creek and the Isaac River are likely to be permanent or semi-permanent, based on the presence of aquatic flora and fauna and/or landholder knowledge.

Existing water quality within the Fitzroy Basin is highly variable, ranging from 'excellent' in undisturbed national parks at the top of some catchments through to 'impacted' in lower areas where a range of land uses are present including grazing, cropping, mining and development. Temporal variation in water quality is also high, with rainfall causing pulses of fresh water, pollutants and sediments to be washed into watercourses and influencing water quality characteristics.

The majority of watercourses within the project area are highly modified as a result of extensive clearing and existing land use practices, with water generally high in turbidity, metals, nutrients and pesticides. Water quality within the project area is also greatly influenced by rainfall events, with many waterways having an absence of flow for extended periods during the dry season.

Key issues related to the management of watercourses associated with all phases of the project include erosion and subsequent bank instability, impact of construction on waterholes and sensitive waterways, sedimentation of receiving watercourses and effects of flooding.

Likely erosion sources as a result of project construction include potential scouring of backfilled trenches in creek beds and banks as well as rilling and gullying of the easement on creek approaches and banks. Poor rehabilitation on creek approaches and banks may result in bank failure.

The greatest risk will be during the initial wet season flows immediately following construction but prior to successful rehabilitation. High discharge velocities, as well as variations in velocity or flow path, could lead to failure of rehabilitation along the ROW.

### Crossing sites have been selected to avoid:

- > Unstable banks;
- > Deep pools;
- > Bends in the watercourse;
- > Rock basements or rock outcrops in the channel; and
- > Confluences with other channels.

Erosion of cover is also possible at creek and river crossings during the operation phase, especially on the banks. Accordingly, stormwater diversion banks are to be installed at the crest of banks of watercourses. For the majority of the creek and river crossings, increased depth of cover to at least 1200 mm will be used and protection measures installed on the banks as required by the crossing design.

The potential impacts of construction activities on water quality at watercourse crossings will be mitigated by scheduling waterway crossing works during the dry season, when the majority of watercourse crossing sites are dry or composed of detached pools.

At wet crossings, erosion control structures (such as silt fences, floatation curtains, sand bags and hay bales) will be placed in the channel and/or stream banks to capture suspended sediment.

Diversion banks at the crest of stream approach slope and on slopes will be used to divert sheet flow away from backfilled trenches.

Where an access track is required through a watercourse, this will, where practicable, be placed on the downstream side of the pipeline to minimise the potential for future erosion over the pipeline.

Creek banks will be profiled and reinstated as near as practicable to their former profile following construction. Accordingly, there will be no change to the hydraulic regimes of any watercourse following construction and rehabilitation.

Provided mitigation measures are implemented, the majority of watercourses can be crossed using conventional open cut techniques without significant impacts on ecological values and water quality. Where potential significant impacts have been identified with open cut techniques, such as the Fitzroy River, Isaac River and Raglan Creek, HDD has been proposed (subject to geotechnical investigation).

Ongoing inspection of watercourses during operation will be undertaken and remedial action will be initiated where required.



> Fitzroy River crossing site

## AIR

**Existing air quality along the proposed pipeline route is influenced by local and regional sources including:**

- > Coal mines;
- > Agricultural activities;
- > Windblown dust from exposed agricultural land and unsealed roads;
- > Dust storms and bushfires (agricultural burning);
- > Motor vehicle emissions from local, regional and state highways along the pipeline; and
- > Industrial sources around Rockhampton and Gladstone.

The main types of air emissions associated with the project will be from particulate matter (dust, principally from clearing and grading, trenching, backfill, reinstatement and vehicle movements) and the combustion products of construction vehicles. The impacts of dust generation will be short term and generally localised as the construction team works through an area. Dust generated will be reduced by using water trucks or other suppression methods, particularly in high wind conditions and/or near any sensitive areas. Other minor sources of air emissions include exhaust fumes from earthmoving and transport equipment. These sources are likely to be negligible in the context of existing pastoral, petroleum production, mining, local traffic and transport land uses in the project area. No significant impact is likely.

The construction of the project is estimated to result in approximately 53,600 t CO<sub>2</sub>-e of greenhouse gases representing 26,800 t CO<sub>2</sub>-e on an annual basis. The annual emissions represent a small fraction of Queensland's (0.02%) and Australia's (0.005%) annual greenhouse gas emissions of 155.1 Mt CO<sub>2</sub>-e and 564.4 Mt CO<sub>2</sub>-e respectively as reported by The Department of Climate Change and Energy Efficiency (DCCEE) for 2010.

Some small quantities of gas will be released into the atmosphere during commissioning activities as gas is introduced into the pipeline and gas quality is monitored. Commissioning will involve purging the pipeline of air with CSG. A slug of nitrogen will be placed between the air and the gas to prevent direct mixing of these two components in the pipeline for safety reasons.

Following the construction phase, the impact on air quality during operations is expected to be negligible. The pipeline will be a buried pipeline that is both externally coated and internally lined. No compression facilities are proposed along the pipeline. Fugitive emissions of gas can occur due to minor leakage from pipeline infrastructure such as valves, flanges, seals and connections. However, fugitive emissions from pipeline operations are extremely low. The risk of pipeline ruptures or leaks is also extremely low due to the implementation of protective measures and routine monitoring, inspection and maintenance. Small quantities of gas may be vented during operations for pipeline and facility maintenance.

The operation of the project is estimated to result in approximately 5,230 t CO<sub>2</sub>-e of greenhouse gases on an annual basis. The annual emissions represent a small fraction of Queensland's (0.003%) and Australia's (0.0009%) annual greenhouse gas emissions of 155.1 Mt CO<sub>2</sub>-e and a 564.4 Mt CO<sub>2</sub>-e respectively as reported by The Department of Climate Change and Energy Efficiency (DCCEE) for 2010.

## NOISE AND VIBRATION

During construction there is the potential for increased noise levels which may impact on nearby residents. The use of heavy plant and equipment in the construction of the pipeline may generate discernible vibrations at residences close to work sites.

A total of 119 residential dwellings have been identified within a 1 km buffer either side of the proposed pipeline route with only two residences being located within 100 m of the proposed pipeline, the closest residential dwelling being located approximately 80 m from the proposed pipeline.

Construction hours will generally be restricted to the daytime period (6.00 am to 6.00 pm) with the exception of a few nights where Horizontally Directional Drilling (HDD) of a watercourse is proposed and during hydrotesting of the pipeline.

Based on the use of a range of construction machinery such as dozers, excavators, and trenching machines, daytime construction noise levels may exceed the project goal at approximately seven noise sensitive receptors located less than 200 m from the construction. For the night time HDD activity currently proposed at the Fitzroy River, parts of the Isaac River and Raglan Creek (subject to geotechnical suitability), the nearest sensitive receptor is located approximately 80 m away from the proposed pipeline route and the noise levels from the HDD activity will meet the project goal at all noise sensitive receptors.

However, in practice, exceedances would be of short duration since construction will move from one area to another as the project progresses and the total duration of construction activity at any location along the pipeline would be limited.

During commissioning of the project, air will be discharged through valves during the purging and introduction of gas. The noise impact from air release would be minimal as this activity will be temporary and would be limited to valve sites along the proposed pipeline route.

Noise would not be generated from normal operation of the project. However, when venting of the pipeline is required (e.g. emergency release) a very loud, high pitched noise would be generated. This would only occur in an emergency and would be a rare event. If venting is required at any other times (e.g. maintenance) local residents, landholders and affected industries will be notified in advance.



## ECOLOGY

### TERRESTRIAL FLORA

Queensland is divided into 13 bioregions based on broad landscape patterns that reflect the underlying geology, climate patterns and broad groupings of flora and fauna. The proposed pipeline route passes through the Brigalow Belt Bioregion, much of which has been cleared for grazing. The desktop flora assessment study area included a 10 km buffer centred on the proposed alignment. This assessment was supplemented by winter and spring field surveys, with the focus on 50m each side of the proposed pipeline, to account for different seasonal variations (to ground truth and verify initial assessment results and mapping) and concentrating on areas of high ecological value identified in desktop studies.

#### The field assessment included:

- > Investigation of the presence / absence or likely presence / absence of Endangered, Vulnerable or Near Threatened (EVNT) flora species, as identified from the State and Commonwealth database searches;
- > Ground-truthing of 392 sites within the proposed ROW and potential alternative ROW alignments;
- > Observations on the wider environment surrounding each site so that the potential impacts associated with the proposed clearing could be discussed in local, regional and State contexts; and
- > Areas within the pipeline corridor have recognised State, Regional or Local biodiversity significance.

Findings of field surveys and examination of recent aerial imagery were consistent with most areas mapped in the Biodiversity Planning Assessments.

#### The proposed pipeline route is characterised by:

- > Non-remnant vegetation (428.79 km or 73.8% of the proposed pipeline route), most of which is cropping and grazing land;
- > High value regrowth (28.06 km or 4.78%); and
- > Remnant vegetation (approximately 124 km or 21.4%) comprising of Endangered Regional Ecosystems (REs) (0.44 km or 0.07% of the route), Of Concern REs (27.8 km or 4.79% of the route) and No Concern at Present REs (95.7 km or 16.4% of the route).

The total disturbance area would be approximately 371.2 ha of remnant vegetation (456.29 ha including high value regrowth) assuming that the entire 580 km by 30 m ROW is cleared.

#### The key flora values potentially affected by the project include:

- > Loss of Endangered brigalow communities on alluvial plains (RE 11.3.1);
- > Loss of Endangered brigalow communities on clay plains (RE 11.4.9);
- > Loss of Endangered Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin;
- > Loss of 12 Of Concern REs (a maximum of 83.5 ha (or 0.15% of the 5 km buffer) would be impacted by the 30 m pipeline route);

- > Loss of 16 No Concern at Present REs (a maximum of 287.21 ha (or 0.22% of the 5 km buffer) would be impacted by the 30 m ROW.
- > Impacts on four Endangered, Vulnerable and Near Threatened (EVNT) flora species recorded in or close to the proposed pipeline route during the field surveys;
- > Loss of potential habitat for EVNT flora species;
- > Loss of freshwater wetland ecosystems and associated riparian vegetation;
- > Loss of marine wetlands and associated marine plants; and
- > Fragmentation of remnant vegetation blocks.



> Remnant vegetation along the pipeline route

Proposed mitigation measures to avoid or minimise clearing of areas of high environmental value and areas of remnant vegetation including:

- > Minor realignments of the proposed pipeline route to avoid or minimise clearing of areas of high environmental value and areas of remnant vegetation generally;
- > The corridor impacted upon by the pipeline construction will be minimised within all areas of remnant vegetation. Clearing widths will be restricted to 30 m;
- > Clearing of remnant vegetation areas will be avoided for the purposes of siting construction camps, lay down areas, vehicle access tracks and other ancillary impact areas, wherever possible; and
- > Clearing boundaries within remnant vegetation areas will be clearly marked in the field.

By implementing the above mitigation measures, the net vegetation disturbance will result in:

- > Clearing of less than 372.1 ha of remnant vegetation;
- > Avoiding impacts on several Endangered Ecological Communities (EECs) and Endangered and Of Concern REs;
- > Little or no impacts on EVNT flora species and essential habitat; and
- > Minor impacts on riparian wetlands and marine wetlands.

While all practicable efforts will be made to avoid and minimise impacts on flora of high ecological value, it is likely that small areas will be cleared or disturbed for construction and thus operation of the pipeline. Where residual impacts cannot be avoided, an offset plan will be prepared and implemented to rehabilitate vegetation similar to that of the impacted vegetation in a nearby location. This applies to the bluegrass areas at the start of the pipeline (AB35.0 to AB36.5 and AB36.8 to AB37.0).

The goal of any offset program will be to achieve a net conservation gain by enhancing the long term sustainability of the vegetation in the Bioregion. Offsets will be developed in liaison with relevant Commonwealth and State regulatory agencies.

## TERRESTRIAL FAUNA

An expanded project area of 20 km buffer to the ROW was utilised to capture sufficient fauna data during desktop assessment. Winter and spring field surveys were conducted to account for different seasonal conditions. The field surveys, conducted at 113 sites, concentrated on the proposed 30 m ROW and included fauna habitat assessments.

A variety of survey techniques were employed during fieldwork to record fauna guilds and their habitats along the proposed alignment. The techniques included trapping, spotlighting, herpetofauna searches, bat echolocation call recording and bird census surveys, which were undertaken at each detailed fauna survey site.

Six habitat types are present in the project area and include Eucalypt woodland and open forest on alluvial soils and old sand plains, woodland and open forest on non-alluvial soils, Brigalow communities, rivers and creeks, grassland and estuarine woodlands on rocky substrates.

### The key fauna issues potentially affected by the project include:

- > Disturbance to mature vegetation and hollow-bearing trees and therefore loss of perching, foraging and nesting resources;
- > Potential disturbance to fauna movement corridors and dry season fauna refuges (predominantly associated with creeks and dams). Such impacts are primarily temporary in nature;
- > A temporary barrier to fauna movement and potential 'trap' provided by the open pipeline trench (trenchfall);
- > Potential limited disturbance to Brigalow communities which provide habitat for the Vulnerable Ornamental Snake;
- > Potential impacts on several EVNT fauna species recorded in or close to the proposed alignment during the field surveys, including the Powerful Owl, Grey Goshawk and Grey Snake;
- > Disturbance to potential habitat for EVNT fauna species including the Yellow Chat, Powerful Owl, Grey Snake, Ornamental Snake, Brigalow Scaly-foot, Yakka Skink, Common Death Adder, Little Pied Bat and Grey-headed Flying Fox;



> **Salmon Striped Frog (*Limnodynastes Salmini*)**



> **Green Tree Snake (*Dendrelaphis Punctulata*)**

- > Limited disturbance to riparian vegetation and associated wetland ecosystems providing restricted habitat types for a range of least concern fauna species; and
- > Fragmentation of remnant vegetation blocks, particularly in association with hills and ranges north of Moranbah.
- > The implementation of appropriate management measures will minimise the potential impacts on terrestrial fauna species including:
- > Monitoring of open trenches by fauna spotters / catchers during the construction period as trenchfall represents the major potential threat to a range of EVNT reptile species known or highly likely to be present in the project area and native fauna;
- > Minor realignments of the proposed pipeline route to avoid or minimise clearing of areas of high environmental value which provide habitat for EVNT fauna species and areas of remnant vegetation; and
- > Use of minimum clearing widths in areas of remnant vegetation which supports high quality fauna habitat.

## AQUATIC ECOLOGY

The aquatic ecology field surveys comprised sampling at 25 watercourses at the proposed pipeline crossing locations using bait traps, fyke nets and seine nets. The majority of the waterways and wetlands intersected by the pipeline are likely to be ephemeral and contain limited habitat for aquatic species.

The desktop assessment identified 35 aquatic flora species recorded within the project area. Targeted searches for these species during field assessments revealed the presence of fourteen aquatic species, none of which were EVNT aquatic flora species.

The proposed pipeline route transects 350 m of saltmarsh and mangrove communities, which contain marine plants and bare marine substrate. Assuming that the entire 30 m ROW contains marine vegetation and/ or habitat and requires removal for construction, the maximum total disturbance area would be approximately 1.05 ha.

The desktop assessment identified 39 native aquatic fauna species and two introduced aquatic fauna species. Fifteen native species of fish and aquatic reptiles and one introduced fish species were captured during the field surveys. None of the fish species recorded during field surveys have a State or Commonwealth conservation status. Platypus was not captured during the aquatic ecology surveys, however they were observed during the terrestrial fauna field survey.

The proposed pipeline route will potentially impact riparian plant species and aquatic plant species associated with watercourses and natural waterholes / wetland areas. Potential impacts to aquatic flora and fauna are likely to occur from trenching and include direct loss of marine plants, loss of marine habitat, changes in hydrology and fish passage, transport of sediment and other pollutants and aquatic weed invasion.

## The implementation of appropriate management measures will minimise the potential impacts on aquatic ecology species and include:

- > Minor realignments of the proposed pipeline route during detailed design to avoid aquatic, riparian and marine vegetation;
- > Investigation into use of HDD techniques (subject to acceptable geotechnical ground conditions) to avoid impacts on major watercourses and marine and aquatic vegetation (such as Isaac River, Fitzroy River and Raglan Creek);
- > Implementation of a Weed Management Plan to prevent the spread of aquatic weeds; and
- > Provision of adequate stream / flow diversions for flowing watercourses during trenching activities and reinstatement of flows at each site, as backfilling is completed.

## CULTURAL HERITAGE

A number of Indigenous heritage sites have been recorded within, or in close proximity to, the project area. These sites include stone artefacts, scarred trees, hearth / ovens, axe-grinding grooves, quarries, wells, shell scatters, burials, rock art and stone arrangements.

Direct engagement with all the Aboriginal Parties is currently underway and had not been completed for the project at the time of preparing the EIS. As such, Arrow is still exploring the specific significance of the cultural places, object and values identified within the desktop searches and investigations.

Arrow has implemented a Native Title and Cultural Heritage compliance strategy for the project. Voluntary agreements in the form of ILUAs will be sought, to resolve both Native Title interests and to provide the necessary consents to comply with the *Aboriginal Cultural Heritage Act 2003* (ACH Act). This strategy also applies for areas that currently have no registered Native Title Determination Applications. For these areas, relevant Native Title interests will be identified by research and public notification processes. A CHMP will be developed to ensure that the project is compliant with the ACH Act Duty of Care, in conjunction with Aboriginal parties along the proposed pipeline route.

For non-Indigenous cultural heritage, the results of the desk top analysis found no sites listed on the Commonwealth heritage lists or registers within the project area. One site listed on the Queensland Heritage Register within 1 km of the project is located outside the project area and will not be impacted by the project. The results of the desktop review will be supplemented by field surveys of the proposed pipeline route to be undertaken by March, 2012.

To mitigate potential impacts on historic heritage values, a draft Historical Heritage Management Plan (HHMP) has been developed and will be implemented as part of the project EMP. With the implementation of appropriate mitigation, it is anticipated that the residual impacts on non-Indigenous cultural heritage will be minor and manageable.

## SOCIAL IMPACT

Potential benefits and impacts on the social environment of local and regional communities in the project area were identified and evaluated. This included an analysis of the potential benefits and impacts of the project's construction, operation and decommissioning, including on community values, population size and characteristics, housing and accommodation, access and connectivity, local business and industry, employment and social infrastructure.

The social impact assessment for the project identified that communities within the project area are reasonably typical of regional Queensland. In 2010, the project area had an estimated residential population of 104,801 people with a slightly higher rate of population growth than for Queensland as a whole.

The project area had relatively low levels of cultural diversity compared to Queensland however a comparable indigenous population to Queensland as a whole. Mining was a key employer in the project area, with approximately 22% of the workforce employed in mining. This is compared to approximately 2.8% in Queensland. Construction and manufacturing were also key employers in the project area.

The majority of social infrastructure in the project area is generally concentrated within major towns such as Moranbah, Gracemere and Gladstone. A number of community facilities are also located within approximately 10 km of the proposed pipeline route, including state schools, emergency services, recreation facilities and aged care facilities.

The proposed pipeline route crosses 232 separate lots, the majority of which is freehold land.

A 30 m wide easement, extending the length of the pipeline, will be acquired by Arrow to allow the construction, operation and maintenance of the pipeline.

Potential impacts of the project on property would generally relate to the temporary disruption to the use of land within the ROW during construction after which the land use reverts to its former use. The final alignment for the proposed pipeline will be determined in conjunction with landholders, which will help to minimise impacts on the use of land and other activities. During operation, land within the pipeline easement can continue to be used for its existing use, although restrictions will be placed on building directly over the easement.

Arrow has commenced consultation and notification of landholders directly affected by the proposed pipeline route and compensation will be paid to directly affected landholders in accordance with relevant legislation. Consultation and communication with property owners during the operation phase will also help to minimise potential property impacts associated with access by maintenance vehicles.

Accommodation for the construction workers will be in temporary workers' accommodation camps near the ROW. In addition, there may be requirements for small specialist work crews which may require accommodation for a few weeks in a local motel. Recreational facilities will be provided in the temporary workers' accommodation camps to avoid impacts on facilities in existing townships. Temporary workers' accommodation camps will also be provided with a range of services and facilities to cater for the day-to-day

needs of workers, including sleeping areas, showers and toilets, laundry, rest and recreation area, kitchen/dining areas and first aid facilities.

Some local workers will be required for jobs such as truck drivers, cleaning personnel and fencing contractors. This provides an opportunity to populations in areas where the unemployment is high, for youth and Indigenous people. Although the work is short term, the skills acquired will assist in obtaining future employment. The use of temporary workers' accommodation camps and a fly-in fly-out (FIFO) workforce will not impact on housing prices or rental prices in the existing townships.

Demand on local hospital-based services is not anticipated, as the temporary workers' accommodation camps have a nurse and/or paramedic who can attend most cases. Workers facing major trauma will be transported to a major regional health facility for specialist care. In rare instances, there may be a minor short term impact on GP services in the projects area when a paramedic is unable to treat a worker and the case is not suitable for transportation to a major regional hospital. Identification of General Practice (GP) services that have the capacity will be provided to workers to ensure GPs are still able to service the local community.

Arrow has contacted with all landholders affected by the proposed pipeline. Environmental issues will be addressed in the EMP. A SCP and SIMP will ensure ongoing community and government consultation, and any social impacts will be mitigated and managed in accordance with these plans. This will ensure that any social and community impacts on existing communities as a result of the project are negligible.

Because of the temporary and transitory nature of the project construction of a 580 km pipeline is expected to take approximately 15 months. It is not expected that there will be any long term demographic impact in the project area.

“  
**A SOCIAL IMPACT  
MANAGEMENT  
PLAN WILL ENSURE  
ONGOING COMMUNITY  
AND GOVERNMENT  
CONSULTATION**  
”



## ECONOMY

**Economic impacts associated with the project have been assessed for all stages of the project including, construction, operation, and decommissioning. Specifically, the project is expected to provide a number of economic benefits to the project area, Queensland and Australia as follows:**

- > Economic modelling has predicted that the project will support an estimated annual average of 2,952 full-time equivalent (FTE) jobs during construction and 28 FTE jobs during operation;
- > Taking flow-on effects into account, the project is estimated to generate a total of \$627 million in personal income from job creation, with \$128 million distributed to employment in the project area. The project itself, is estimated to directly provide almost \$35 million in personal income over the project life; and
- > In total, the project will directly inject close to \$891 million into the Australian economy and create a total impact across Australia of close to \$2.9 billion. The majority of project benefits occur throughout the construction stage of the project, reflecting the magnitude of the capital investment and direct injection in the economy.

Other economic effects associated with wages, prices, consumption, property values and unemployment within the project area include:

- > Given the timing of construction and high likelihood of a FIFO workforce, the impact on wages and salaries in the project area is expected to be minimal at a project level;
- > The timing of project construction is likely to contribute to stable demand as opposed to a significant shock to the economy and there is not expected to be significant upward pressure on other factor prices;
- > Direct employment required for operation of the project is not significant. Therefore increase in demand for housing in the project area is limited and is not expected to have an impact on property values;
- > At a regional level, the project is not expected to impact heavily on unemployment, although any effect would be positive on the workforce; and
- > At a regional level, the impact is not expected to be significant and will depend on where specific impacts occur and the extent to which income earned by workers during construction is consumed in localities along the proposed pipeline route

Where practical and cost effective, locally sourced inputs (labour and materials) will be examined to enhance the economic benefit to the project area and Queensland's domestic economy.

## HEALTH AND SAFETY

The health and safety of the community will be given high priority during all phases of the project, from construction through to its eventual decommissioning.

Arrow Energy maintains an Environmental, Health and Safety Management System which provides a framework for continually improving the management system to ensure responsible management practices that minimise any adverse environmental, health and safety impacts arising from its activities.

**The project objectives relevant to community health and safety and quality of life include:**

- > To protect the environmental values relating to people and property, whilst maintaining a high level of safety;
- > Maintain a safe working environment for the construction workforce and near neighbours;
- > Maintain a safe working environment during operation for maintenance teams and near neighbours; and
- > To prevent or minimise any losses or damage to people and property.

No health and safety community-related impacts are predicted for the project. This is due to the separation distance of human residences, places of work, schools, recreational features, aged care facilities, etc. from the project area. Temporary workers' accommodation camps will be specifically located away from community infrastructure.

Measures will be put in place to restrict public access to construction activities. There will be an ongoing program of community information and education during construction and signs will be installed along the ROW where it intersects with the public road network, to ensure public awareness of the project area, and to provide contact information in the event of an incident.

During the operational phase, valve stations and other above-ground installations along the proposed pipeline route will be fenced and appropriate signs erected. Regular inspections will be made along the ROW to detect any third party activities that may interfere with the pipeline or create a public risk.

Any potential health and safety impacts will be managed through appropriate health and safety policies as part of the Construction Safety Management Plan (CSMP) compliant with AS 4801. Health and Safety Officers will be present on the construction site.

## HAZARD AND RISK

A requirement of AS 2885.1 during the preliminary design phase is the preparation of an Initial Safety Management Study (Initial SMS). The Initial SMS was conducted in August 2011 to determine high consequence events and their proposed controls.

The key hazards and risks identified during construction include:

- > Construction activities impacting on major crossings, such as roads, railways, watercourses and potential disruption to buried services (e.g. severance of electricity, telecoms and water services);
- > The use, storage and transport of any hazardous materials or dangerous goods, including oils, fuels, chemicals, lubricants, solvents or biocides;
- > Transportation of construction materials and personnel;
- > Bushfire initiated by construction activities; and
- > Natural hazards from potential floods, bushfires, landslides or earthquakes.

The key hazards and risks identified during operation include:

- > Accidental release of gas / explosion (e.g. pipeline incident from excavations, pipeline corrosion, equipment failure, incorrect temporary storage or containment of hazardous substances);
- > Natural hazards from potential floods, bushfires, landslides or earthquakes impacting on the pipeline and/or facilities; and
- > Bushfire initiated by pipeline maintenance activities or by third party incident.

The preliminary hazard identification and risk assessment conducted for the project shows that the residual risks for the project are insignificant and minor. No moderate, major or catastrophic residual risks have been identified.

The majority of the hazards and risks identified are related to typical construction activities which will be effectively mitigated. The key hazards and risks during operation will be managed by a comprehensive operations and maintenance program. Adherence to relevant legislation, policies, guidelines and standards for pipeline construction and operation will ensure that the probability of an incident is low.

An Emergency Response Plan (ERP) will be prepared for all likely emergency situations and incidents that could occur during construction or operations as a result of natural hazards, systems and equipment failure or by human error.

Consequently, the objectives relating to minimising hazards and risks on people and property will be met during all project phases.

## COMMITMENTS

In addition to the broader project benefits, Arrow is committed to managing project-specific impacts at a regional and local scale. Arrow has committed to a number of mitigation measures to reduce and manage potential impacts from the project with a net positive effect on environmental, economic and social values.

Mitigation measures have been developed to reflect best practice environmental considerations for gas pipelines that align with both regulations and Arrow Energy's Environmental Policy and Management System as presented in the EMP prepared for the project. The mitigation measures have been developed to reflect the outcome of consultation with the landholders and other stakeholders as well as Arrow's commitment to Ecologically Sustainable Development (ESD).

The environmental footprint of the project will be reduced by promoting energy efficiency, water recycling and waste management while avoiding sensitive vegetation communities, habitat areas and species to the greatest extent possible. Arrow has applied the principles of ESD in the project planning process and in selecting the most appropriate alternatives for the proposed pipeline route.

The project has not yet been referred to the DSEWPAC to determine if it will be a controlled action under the EPBC Act. Referral will be made early 2012.

Applications for development approvals and permits will be made as required post-EIS determination.

Arrow has developed an SCP, which clearly states project stakeholder and community engagement goals, processes and outcomes, and how these will be achieved in a timely and effective manner. Arrow will maintain an active stakeholder liaison program during all phases of the project. Undertaking appropriate and effective stakeholder consultation is an essential element of the project.

Arrow is exploring the specific significance of the cultural places, object and values identified within the desktop searches and investigations and is committed to finalising field surveys of non-indigenous cultural heritage by the end of March, 2012.

Arrow intends to develop ILUAs with relevant native title parties along the proposed pipeline route and work on these respective ILUAs is well advanced. CHMPs will be contained in the relevant ILUAs or will be developed separately for approval by DERM to satisfactorily address the cultural heritage interest of the relevant Aboriginal Parties along the proposed pipeline route.

While all practicable efforts will be made to avoid and minimise impacts on flora of high ecological value, it is likely that small areas will be cleared or disturbed for construction and operation of the project. Where residual impacts cannot be avoided, an offset plan will be prepared and implemented to rehabilitate vegetation similar to that of the impacted vegetation in a nearby location.



The goal of any offset program will be to achieve a net conservation gain by enhancing the long term sustainability of the vegetation in the Bioregion. Offsets will be developed in liaison with relevant Commonwealth and State regulatory agencies.

A Water Options Study will be undertaken to provide greater detail on available sources and facilitate further development of the water resourcing strategy for the project construction phase.

A Pipeline Safety Management Study and Safety Operating Plan will be prepared and subjected to regular compliance audits. These will be updated at intervals not exceeding five years or as required due to a significant change of operating conditions, a change to the state of the knowledge affecting the safety of the pipeline, or relevant legislative requirements.

## CONCLUSION

The project will play an important role in maintaining and further developing the economic competitiveness of CSG and, ultimately, LNG distribution globally. The project will provide socio-economic benefits to Queensland, contributing to Commonwealth, State and local economies while recognising the environmental value of the project area by adding to Queensland's long term infrastructure inventory.

The EIS has demonstrated that potential adverse environmental and socio-economic impacts associated with the project will be mitigated. The project will provide benefits to the community in terms of income generation and local employment.

Arrow has committed to a range of measures to protect and enhance the natural environment. The project is expected to have negligible impacts on landholders and environmental values.

## RECOMMENDATION

Having regard to the benefits and the impacts of the project as outlined in the EIS, it is recommended that the project proceeds subject to the commitments made in the EIS and EMPs, which will be developed in more detail prior to construction and operation.

The Chief Executive of DERM is requested to evaluate the EIS and state the conditions under which the project may proceed.



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