



ARROW BOWEN PIPELINE PROJECT

EPBC REFERRAL – SUPPORTING DOCUMENTATION

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Contents

1. INTRODUCTION	1
1.1. Overview of the project	1
1.2. Purpose of the report	1
2. Detailed description of proposed action	2
2.1. Description of proposed action	2
2.2. Alternatives to taking the proposed action	10
2.3. Alternative locations, time frames or activities that form part of the referred action	13
2.4. Context, planning framework and state/local government requirements	13
2.5. Environmental impact assessments under Commonwealth, state or territory legislation	18
2.6. Public consultation (including with Indigenous Stakeholders)	19
2.7. A staged development or component of a larger project	24
3. Description of environment and likely impacts	26
3.1. Matters of national environmental significance	26
3.1.1. 3.1(d) Listed threatened species and ecological communities	26
3.1(e) Listed migratory species	38
4. Measures to avoid or reduce impacts	42
4.1. Flora	42
4.2. Fauna	43
4.3. Migratory species	45
5. Conclusion on the likelihood of significant impacts	46

Figures

Figure 2-1: Indicative corridor layout for pipeline construction	4
Figure 2-2: Arrow Energy's acreage position and CSG assets in Queensland	25

Tables

Table 2-1: Summary of pipeline operational activities	7
Table 2-2: Stakeholders for the project	20
Table 3-1: EPBC flora species potentially occurring in the vicinity of the proposed pipeline route	27
Table 3-2: EPBC Listed EECs and Equivalent REs within the ROW and the 5 km Buffer	29
Table 4-1: Proposed mitigation measure for black ironbox (<i>Eucalyptus ravertiana</i>)	42

Appendices

Figure A-1: Project Overview	
Figure A-2: Alternative route options for the project	
Figure A-3: Location of EPBC Fauna species	
Figure A-4: Potential habitat for Bluegrass traversed by the pipeline	
Figure A-5: Potential habitat for the Yellow Chat traversed by the pipeline	
Figure A-6: Potential habitat for the Water mouse traversed by the pipeline	
Figure A-7: Potential habitat for the Ornamental Snake traversed by the pipeline	

1. INTRODUCTION

1.1. OVERVIEW OF THE PROJECT

Arrow Bowen Pipeline Pty Ltd (Arrow) is the proponent for the Arrow Bowen Pipeline project (the project). Arrow is a subsidiary of Arrow Energy Pty Ltd (Arrow Energy), a wholly owned subsidiary of Arrow Energy Holdings Pty Ltd (the Parent Company).

The proposed action involves the construction of a 580 km long buried high pressure coal seam gas (CSG) pipeline of up to 42 inches (1,050 mm) in nominal diameter and consists of the Arrow Bowen (AB) mainline and three laterals, the Elphinstone Lateral (EL), Saraji Lateral (SL) and Dysart Lateral (DL). The project also includes above ground facilities, temporary workers' accommodation camps and temporary support facilities. The proposed pipeline route will require a 40 m Right of Way (ROW) to support construction activities, including clearing and grading, trenching and spoil placement, stringing, pipeline welding and laying.

The project will deliver coal seam gas (CSG) from Arrow Energy's gas fields in the Bowen Basin 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. An overview of the project is shown in **Figure A-1** in **Appendix 1**.

1.2. PURPOSE OF THE REPORT

The purpose of this report is to provide further supporting information for the referral under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. In particular, this report focuses on the Matters of National Environmental Significance (MNES) potentially affected by the project, being listed threatened species and ecological communities (sections 18 and 19A), and migratory species protected under international agreements (sections 20 and 20A).

2. DETAILED DESCRIPTION OF PROPOSED ACTION

2.1. DESCRIPTION OF PROPOSED ACTION

Pipeline route

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 the Marlborough Creek from the vicinity of Develin to 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 to the GGH in the Aldoga precinct.

The location of MNES potentially affected by the project, being listed threatened species and ecological communities and migratory species is described in this document in accordance with kilometre points (KP), as follows:

- For the Arrow Bowen (AB) mainline – AB is the prefix for kilometre point; AB0 indicating the most northern point and AB477 indicating the most southern point;
- For the Elphinstone Lateral (EL) – EL is the prefix for kilometre point; EL0 indicating the most northern point and EL52 indicating the most southern point where this lateral feeds into the AB mainline;

- For the Saraji Lateral (SL) – SL is the prefix for kilometre point; SL0 indicating the most western point and SL25.8 indicating the most eastern point where this lateral feeds into the AB mainline; and
- For the Dysart Lateral (DL) – DL is the prefix for kilometre point; DL0 indicating the most western point and DL25.7 indicating the most eastern point where this lateral feeds into the AB mainline.

Key characteristics of the project

The project will involve the construction of approximately 580 km of high pressure gas pipelines in Central Queensland comprising a main pipeline (the AB mainline), three lateral pipelines (EL, SL and DL) and associated infrastructure.

The pipeline will be laid in a trench with a minimum depth of cover of 750 mm. At watercourse crossings, the minimum depth of cover will be increased to at least 1,200 mm.

A 30 m to 40 m wide ROW will be established for construction and converted into a 30 m wide operational easement for subsequent pipeline operation and maintenance.

The project will have a minimum technical design life of 40 years, however, with ongoing integrity management the operational life is expected to be in excess of this figure.

The proposed pipeline will be typical of a modern, large diameter gas transmission pipeline and will be designed, constructed and operated in accordance with the Australian Standard (AS) 2885 series.

Final parameters of the project are yet to be determined, but will most likely include:

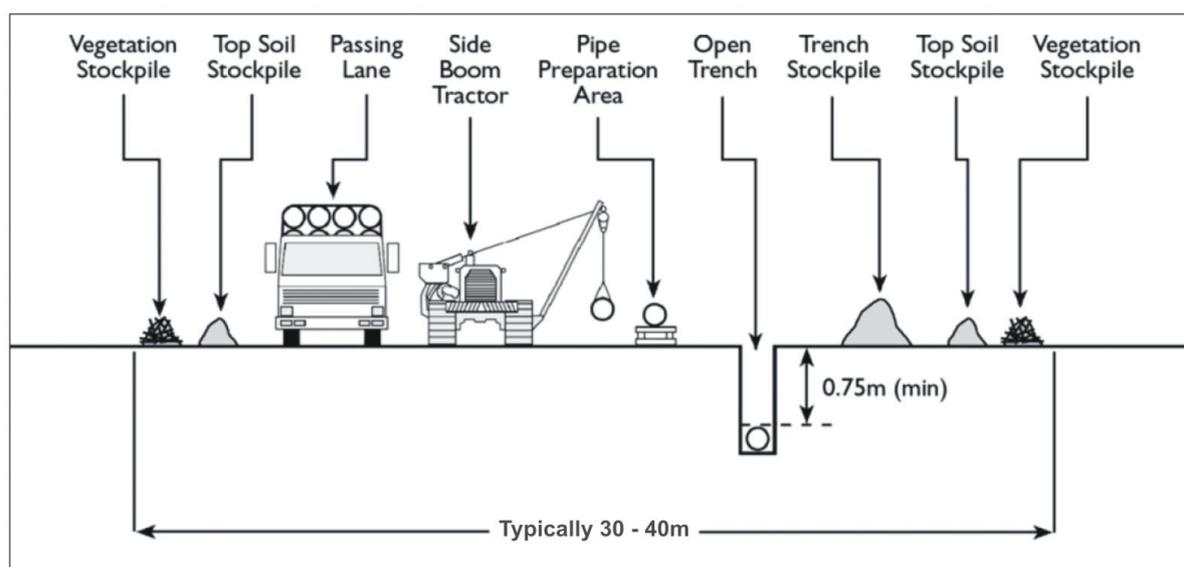
- A buried, high pressure, steel, natural gas pipeline, with a nominal diameter of up to 42 inch (DN1050) for the AB mainline and up to 20 inch (DN500) for the lateral pipelines including some 16 inch (DN400) buried steel pipeline.
- A connection to a proposed gas hub near the Bruce Highway, approximately 22 km southwest of Gladstone;
- Above ground facilities at intervals along the proposed pipeline route including mainline valves, scraper stations, cathodic protection systems and marker signs; and
- Temporary workers' accommodation camps.

Pipeline construction

The proposed pipeline will be constructed in accordance with AS 2885 and the *Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines* (APIA, 2009). Construction will require a ROW along the proposed pipeline route with a width of 30 m to 40 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 during the construction works (**Figure 2-1**). Additional areas will be required for access tracks, truck turnarounds, pipe and equipment laydown areas and temporary workers' accommodation camps.

It is envisaged that the pipeline will be constructed over 15 months, commencing in April 2016 and undertaken during the 2016 and 2017 dry seasons. It is proposed to award the contract for the 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

Figure 2-1: Indicative corridor layout for pipeline construction

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:

- Minor realignments of the proposed pipeline route during detailed design with the aim of minimising effects by avoiding passing directly through intact habitat patches but only touch one edge of the patch.
- Establishment of temporary facilities such as work areas for equipment and pipe storage, temporary workers' accommodation camps 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. The areas affected will be reduced by using pre-existing clearings and reducing clearing widths in endangered communities;

- 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 A qualified and experienced fauna spotter / handler will check the trench for captured fauna at least daily, preferably in the morning to remove animals prior to the heat of the day;
- Lowering the pipeline string into the trench on top of padding (fine sub-soil) 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; and
- Cleaning up, restoring and rehabilitating the ROW, access tracks and temporary workers' accommodation camps.

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 camps, as soon as practical after the ROW construction activities in the area have been completed.

Workforce and temporary workers' accommodation camps

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.

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. 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. 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 the site: no environmentally significant species or cultural heritage significance present, suitability of soil or 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 as close to the ROW as possible.
- Separation from flood prone areas: the temporary workers' accommodation camp will need to be located outside of flood prone areas.
- Separation from habitation: the temporary camps will be located 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 Integrated Development Assessment System (IDAS) pursuant to the *Sustainable Planning Act 2009* (SP Act).

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 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 may initially contain 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.

Operation

The operation of the pipeline will be in accordance with approval documentation, a specific Environmental Management Plan (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% examination of welds and a high pressure hydrostatic test at pressures in excess of the Maximum Allowable Operating Pressure (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. Following reinstatement and revegetation of the ROW, very little above ground infrastructure will be visible.

A summary of operational activities is provided in **Table 2-1**.

Table 2-1: Summary of pipeline operational activities

Activity / issue	Description / management
Weed control	Localised weed spraying (in consultation with landholders) undertaken along the easement as required (primarily in the first 12 months following commissioning) will form a key part of ongoing maintenance of the project site.
Line of sight clearance	To maintain line of sight, clearance of the pipeline easement, within three metres of the proposed pipeline centerline, will be required as shrubs and trees regenerate within 3.5m of the proposed centreline. Regeneration of shrubs and trees elsewhere on the easement will be encouraged to preserve continued pipeline integrity.

Activity / issue	Description / management
Aerial inspection of easement	Inspections may be undertaken using rotary or fixed-wing aircraft, particularly in areas where only limited public road access is available. Frequency will vary depending upon the particular issue being inspected, but is typically monthly or quarterly.
Patrolling / inspections easement access	This will be undertaken, in conjunction with aerial inspections, by travelling along the project site in vehicles on an as-needed basis. This will involve access to private property and use of private access tracks.
Pipeline operations	
Cathodic protection surveys	Surveys travelling the pipeline easement and stopping to measure cathodic protection point output. Typically conducted annually. Depending upon the results detected, this may also involve coating repairs – refer to ‘excavations’.
Testing and inspection valves	Valves will be operated to ensure their availability in the event of an emergency. Extremely small volumes of gas may be released during this activity as the valves are likely to be powered by the pressure in the pipeline. Typical frequency is annually.
Erosion repair	Following major rainfall events, the pipeline easement will be subject to aerial inspection (particularly during the first 24 months after commissioning) to determine if any areas have suffered from erosion or subsidence. Any areas detected will be repaired immediately to match existing ground contours.
Emissions	Throughout the lifetime of the project, small amounts of gas may be released to the atmosphere under controlled conditions during pipeline and facility maintenance.
Pipeline incident	<p>The main threats to public safety during operation and maintenance are fire, explosion or radiation exposure as a result of pipeline rupture. Pipeline risk assessments have identified that these threats are associated with factors such as third party or external interference to the pipeline and pipeline (external) corrosion.</p> <p>All identified threats presenting an unacceptable level of risk will be mitigated through adoption of AS 2885.</p> <p>The pipeline will also be constructed and operated according to the Pipeline Protection Safety Measures contained in the approved Safety and Operating Plan and in accordance with an approved Emergency Response Plan.</p>
Pipeline maintenance	
Coating integrity surveys	Immediately after commissioning, and generally in conjunction with the annual cathodic protection surveys referred to above, a coating conductance test (Direct Current Voltage Gradient survey) will be carried out to determine if there are any defects in the external pipe coating that might compromise the continued long term integrity of the pipeline. Where these readings indicate that such defects cannot be controlled by the cathodic protection system, the section will be excavated and the pipeline coating repaired.
Pigging	Pigging is periodically undertaken to assess the continued integrity of the pipeline. An ‘intelligent pig’ is placed into the pipeline at a launcher station and is propelled through the pipeline by the gas flow before removal at a pipeline receiver station. This pig detects any damage to the pipeline and is used to direct repairs if significant damage is detected. Minor venting of gas to the atmosphere results during pig removal.

Activity / issue	Description / management
Excavations, including coating refurbishment, installation of anode beds, emergency response exercises and new tie-ins	Excavations of the proposed pipeline include clearing and grading, trenching, backfilling and restoration and rehabilitation, but are on a much smaller scale. Once vegetation and topsoil have been cleared and stockpiled, the excavation is performed and spoil stockpiled. The pipeline maintenance is then undertaken – this may include welding, non-destructive testing, blast cleaning and painting/coating. Once complete, the trench is then backfilled, the ground surface re-contoured and topsoil re-spread. Some reseeded may also be undertaken if needed. These activities are expected to be very rare during the operational lifetime of the pipeline.
Replacement of pipeline section	The pipeline is isolated and a controlled release of gas may be required from the affected section. The affected area is then excavated, the old pipe removed and a new section installed – this includes welding, blasting and coating. This is expected to be a particularly rare event during the operational lifetime of the proposed pipeline.
Welding	Welding is usually only required during pipeline repairs or when modifications to existing infrastructure may be required. Pipeline welding requires excavation of the pipeline as described under excavations earlier in this table.
Coating	Heat shrink sleeves or tape are expected to be applied to effect coating repairs occasioned during any of the above repair work.
Pressure testing	When a section of pipe is replaced, a section of pre-tested pipe, from stock held for this purpose, is used. Where a facility is installed that has to tie-in to the pipeline, additional sections will generally be pre-tested prior to installation.
Facility operation and maintenance	
Gas hub	The proposed GGH is where the pipeline will join with the ASP. It will consist of pipeline isolation valves and scraper station plus an interconnector. These operate continuously.
Scraper station	A facility for the launching and receiving of pipeline pigs.
Weed control	Localised weed spraying is undertaken in and around above ground facilities typically one to two times per year.
Production of hazardous wastes	Waste hydrocarbons are generated from maintenance / pigging operations.
Waste disposal	General waste generated during operations is collected on site and removed to licensed facilities for disposal.
Station blow downs	All venting during emergency situations is controlled by Emergency Response Procedures.

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.

2.2. ALTERNATIVES TO TAKING THE PROPOSED ACTION

There are a number of potential alternatives associated with the project and selection options, including:

- Development of the Central Queensland Gas Pipeline (CQP);
- No project option;
- Alternative pipeline route options; and
- Changes to project design, construction techniques and environmental impact mitigation measures.

Development of the Central Queensland Gas Pipeline

Arrow Energy is currently a 50/50 joint venture holder with AGL Energy Ltd, the proponent for the proposed Central Queensland Gas Pipeline (CQP) (PPL121). The CQP involves the construction and operation of a 440 km long high pressure gas transmission pipeline from Moranbah to Gladstone in Central Queensland. The CQP, if developed, will 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 is no longer considered suitable as a transmission pipeline for CSG from Arrow Energy's tenements in the Bowen Basin having regard to the following:

- The design capacity of the proposed Arrow LNG Plant dictates that 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.

The extent of Arrow's Petroleum Leases (PLs) and Authority to Prospect areas north of Moranbah indicate that a more refined pipeline route should be examined to bring gas from these areas to the Arrow LNG Plant on Curtis Island.

The proposed pipeline route will follow the former, and now relinquished, Papua New Guinea (PNG) pipeline route from the Broadsound Range to Rockhampton. From Rockhampton to Gladstone, the SGIC SDA is being considered for the proposed pipeline route which terminates at a proposed gas hub near Mount Larcom, approximately 22 km southwest of Gladstone. From the gas gathering station the pipeline will connect to the Arrow Surat Pipeline (ASP) for delivery to the proposed Arrow LNG Plant.

No project option

The consequences of not proceeding with the project would mean benefits such as contribution to economic growth and employment would not be realised. This would be to the detriment of the local, regional, state and national economies. Increased competition in the gas supply market would potentially be compromised, potential increase in export markets would likely be delayed or not achieved and the direct economic benefit from construction expenditure and the longer term benefits of the pipeline operation would not be realised.

Alternative pipeline route options

Arrow explored a number of alternative pipeline route options for the supply of CSG from the Bowen Basin to the Arrow LNG Plant on Curtis Island. 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 of topographical and ecological mapping. Each alternative pipeline route commenced in the Bowen Basin, approximately 90 km north of Moranbah and consisted of a number of headers and lateral pipeline options. Following a desktop review, field surveys concentrated on two alternative pipeline route options as illustrated in **Figure A-2, Appendix 1**.

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

The alternative pipeline route is 60 km longer, transects cropping land adjacent to the Mackenzie River and Dulu 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.

2.3. ALTERNATIVE LOCATIONS, TIME FRAMES OR ACTIVITIES THAT FORM PART OF THE REFERRED ACTION

The proposed action does not include alternative timeframes, locations or activities.

2.4. CONTEXT, PLANNING FRAMEWORK AND STATE/LOCAL GOVERNMENT REQUIREMENTS

Arrow has an approved Environmental Authority (EA) (PEN201616610) and a Petroleum Survey Licence (PSL) (PSL 64) for the project from the Department of Environment and Resource Management (DERM) and Department of Employment, Economic Development and Innovation (DEEDI) respectively pursuant to Chapter 4, Part 1 of the *Petroleum and Gas (Production and Safety) Act 2004* (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. The Public Service Department Arrangements Notice (No1) 2012, identifies changes to these government departments.

If petroleum is required to be transported outside the area of a petroleum lease an application must be made to Minister of the Department of Natural Resources and Mines (DNRM) for the grant of a pipeline licence (PPL). The pipeline will be licensed under the P&G Act. An EA under the *Environment Protection Act 1994* (EP Act) will be required from the Department of Environment and Heritage Protection (DEHP) for a Level 1 Environmentally Relevant Activity (ERA), as defined in Schedule 5, *Environmental Protection Regulation 2008*, namely “*constructing a new pipeline of more than 150 km under a petroleum authority*”.

A number of additional approvals will be required following DEHP’s assessment of the Environmental Impact Statement (EIS) and DNRM’s grant of the PPL. These will be obtained at a later date once full details of construction and operation are known. Applications for Development Approvals (DAs) for the temporary workers’ accommodation camps will be made under the IDAS pursuant to the SP Act.

Commonwealth approvals

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The EPBC Act protects the environment in general, and particularly in relation to matters of National Environmental Significance (MNES). Based on the information provided in the EIS, it is considered that the development proposal does not involve an action that may have a significant impact on matters of NES.

Native Title Act 1993 (NT Act)

Under the NT Act, indigenous land rights may exist in areas such as vacant or unallocated Crown land, some reserve lands, some types of pastoral lease and waters that are not

privately owned. Native title can be extinguished by certain actions (For example, where the land is held under freehold title).

The native title process being undertaken for this proposed action involves the development of Indigenous Land Use Agreements (ILUAs) with the registered native title claimants along the route, with these ILUAs to be lodged for registration with the National Native Title Tribunal.

Aboriginal and Torres Strait Island Heritage Protection Act 1984 (ATSIHP Act)

The ATSIHP Act provides Indigenous (Aboriginal and Torres Strait Island) people in any Australian state or territory (with certain caveats pertaining to Victoria) with the right to request the relevant Commonwealth Minister to intervene in matters where traditional cultural heritage interests are considered to be at risk.

Cultural Heritage Management Plans (CHMPs) will be contained in the relevant ILUAs (currently being prepared by Arrow) or be developed separately for approval by DEHP to satisfactorily address the cultural heritage interest of the relevant Aboriginal Endorsed Parties along the proposed pipeline route. It is considered that the ILUA / CHMP will comply with the ATSIHP Act and the NT Act as well as applicable state government cultural heritage legislation.

State approvals

Petroleum and Gas (Production and Safety) Act 2004 (P&G Act)

Arrow has an approved EA (PEN201616610) and a Petroleum Survey Licence (PSL) (PSL 64) for the project from DEHP and DNRMI respectively pursuant to Chapter 4, Part 1 of the P&G Act..

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, plant and equipment) will be required from the Minister of DNRMI. Similar to a PSL, an EA is required for the project from DEHP before the PPL can be issued.

A PPL exempts some pipeline activities from approval under other Acts, for example vegetation clearing under the *Vegetation Management Act 1999* (VM Act). Exemptions only apply if works are conducted for activities authorised under the PPL and located within the specified PPL area.

Environmental Protection Act 1994 (EP Act) and Environmental Protection Regulation 2008 (EP Regulation)

Construction of a new transmission pipeline greater than 150 km is classified as a Level 1 Chapter 5A petroleum activity under the EP Regulation. To undertake a Level 1 petroleum activity (which is also defined as Level 1 Environmentally Relevant Activity (ERA) under the EP Act), an EA must be issued by DEHP.

As mentioned above, an EA must be issued by DEHP before a PPL can be granted. As part of the EA application for this Project, 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, temporary worker's accommodation camps etc.) and sets environmental protection commitments for construction and operations.

Environmentally Relevant Activities (ERAs), defined under Schedule 1 of the EP Regulations, are activities with the potential to release contaminants to the environment and cause environmental harm.

It is noted that approval for ERAs is required from DEHP for the temporary workers' accommodation camps (electricity generation, fuel burning and sewerage treatment) and they will be sought separately to the EIS process under the IDAS pursuant to the Sustainable Planning Act (SP Act).

State Development and Public Works Organisation Act 1971

The SDPWO Act establishes an environmental assessment process for projects declared to be 'significant projects' by the Queensland government. Projects declared significant are generally economically or strategically important for the state, or highly complex requiring centralised coordination or assessment by the Coordinator-General (DNRM). Division 3 of the SDPWO Act is not relevant to the project as it is not a significant project and Arrow has opted to undertake a voluntary EIS under the provisions of the EP Act.

There is provision for the state to provide access to land for the purposes of an infrastructure facility of significance (such as a pipeline) under Section 125 of the *State Development and Public Works Organisation Act* (SDPWO Act). Where landholders or native title claimants do not enter into land access agreements, Arrow may rely on state intervention to obtain access to these parcels of land through a compulsory acquisition process provided that Arrow can demonstrate that it has made genuine and repeated attempts to obtain this access by direct agreement with the landholder.

Water Act 2000 (Water Act)

The Water Act regulates the use, flow and control of water including water in a watercourse, lake or spring, underground water, overland flow water, water that has been collected from a dam and recycled and desalinated water.

Under the Water Act, activities that will involve vegetation destruction, excavation and fill in a watercourse are exempt from assessment under section 49, 50 and 51 of the *Water Regulation 2002* (Water Regulation) as long as they are authorised under a licence, petroleum lease or authority to prospect under the P&G Act. If works are undertaken outside the PPL area, a Riverine Protection Permit (RPP), which will require the written consent of adjacent land owners, will be required under the Water Act to remove vegetation, excavate and fill within the waterways.

A permit is also required to source water from a watercourse, lake, spring or aquifer for an activity of a temporary nature under section 237 of this Act. Water may be temporarily required during construction of the proposed pipeline route for horizontal directional drilling (HDD), hydrotesting, dust suppression and for potable temporary workers' accommodation camp water. This permit process is separate to the SP Act and is required regardless of the PPL granted under the P&G Act.

Vegetation Management Act 1999 (VM Act)

The VM Act provides for the conservation of native vegetation in Queensland and regulates the clearing of mapped remnant vegetation (termed Regional Ecosystems (RE)) and high value regrowth vegetation on freehold and leasehold land. Approval under VM Act is required if remnant vegetation is to be cleared, with applications for approval likely to be accompanied by a Property Map of Assessable Vegetation (PMAV). An exemption applies where the clearing is for a 'specific activity' listed in Schedule 24 of the SP Regulation which includes clearing for a chapter 5A activity (Part 1, Item 1(6)).

As such, vegetation clearing on freehold and leasehold land is exempt from assessment under the VM Act where the construction of the proposed pipeline, including incidental activities, is undertaken within the area covered by the PPL. Clearing related to incidental activities outside the PPL area, such as temporary workers' accommodation camps and borrow pits, which involve vegetation clearing will require development approval.

Nature Conservation Act 1992 (NC Act)

The NC Act has a number of associated regulations, plans and orders to protect Endangered, Vulnerable and Near Threatened (EVNT) species.

The NC Act and regulations state that any person taking, using or interfering with protected EVNT fauna is required to have a Wildlife Rehabilitation Permit (spotter-catcher) and to possess the training and skills required to undertake this activity. Such a permit will allow a person to rescue and release a sick, injured or orphaned protected animal; or a protected animal whose habitat has been, or will be, destroyed by human activity or a natural disaster.

A clearing permit (protected plants) is also required to be obtained from DEHP where taking, using or interfering with EVNT flora under the NC Act.

Land Act 1994 (Land Act)

The Land Act provides a framework for the allocation of state land as leasehold, freehold or other tenure. Under Chapter 4, Part 4 of the Land Act, a permit to occupy is required from DEHP where the project is developed on a reserve, road or unallocated state land.

Further, a permit is required under section 113 of the Land Act for clearing of vegetation on all state lands. The application must be made to DEHP regardless of whether the clearing will take place within or without the PPL area.

Aboriginal Cultural Heritage Act 2003 (ACH Act)

All objects and areas of Aboriginal cultural heritage significance in Queensland are dealt with under the ACH Act. The ACH Act covers places of archaeological and historical significance.

The ACH Act operates on the basis of a duty of care owed by development proponents and others to Aboriginal cultural heritage.

In this case, it is necessary that a CHMP or native title agreement be prepared in consultation with the relevant Aboriginal parties to ensure that Aboriginal cultural heritage duty of care is fulfilled. A native title agreement may include an ILUA, section 31 agreement or use of the Native Title Protection Conditions. ILUAs are being prepared for the project with the relevant parties for the project and will include specific measures for the management of Aboriginal cultural heritage. If an ILUA cannot be finalised in accordance with the project's requirements, an approved CHMP will be agreed with the relevant parties.

Queensland Heritage Act 1992 (QH Act)

Historic heritage in Queensland is protected under the provisions of the QH Act. This legislation protects all those places included on the Queensland Heritage Register (QHR). It also protects archaeological places where there is an expectation of sub-surface material that can provide information regarding the history of Queensland. Although this Act contains provisions for the protection of indigenous cultural heritage, items that derive their significance solely from their association with Aboriginal custom or tradition are excluded from protection under the QH Act. A non-indigenous heritage assessment was prepared for the project which addresses the QH Act.

Fisheries Act 1994 (Fisheries Act)

The Fisheries Act regulates the management, use, development and protection of fisheries, resources and fish habitats and the management of aquaculture activities. The disturbance of marine plants and the construction and raising of waterway barrier works are administered under the Fisheries Act.

Where waterway barrier works are deemed self-assessable, the works must comply with the Code for self-assessable development, temporary waterway barrier works. If waterway barrier works are not deemed self-assessable, an approval from DNRM will be required prior to works commencing.

Transport Infrastructure Act 1994 (TI Act)

The TI Act regulates infrastructure (including roads, rail, light rail, busways, ports, air, marine and miscellaneous) throughout Queensland and encourages effective integrated planning and efficient management of transport infrastructure.

Approval is required from the Department of Transport and Main Roads (DTMR) and Queensland Rail (QR) to work on, or interfere with, state owned roads and railways respectively.

Sustainable Planning Act 2009

The SP Act establishes the legislative framework for state and local government planning scheme approvals under the IDAS. The SP Act is accompanied by the *Sustainable Planning Regulation 2009* (SP Regulation) which identifies various aspects of development as either assessable, self-assessable, compliance assessable or exempt from assessment.

The pipeline and associated incidental activities that are located within the PPL area, as licensed under the P&G Act, are exempt from assessment against the local planning schemes in accordance with Schedule 4, Table 5, Item 3 of the SP Regulation. Other approvals may be triggered under the SP Act for activities within the PPL area where they are not directly associated with the pipeline. Incidental activities associated with the project, such as temporary workers' accommodation camps, undertaken outside of the PPL area, may require development approval pursuant to the SP Act.

2.5. ENVIRONMENTAL IMPACT ASSESSMENTS UNDER COMMONWEALTH, STATE OR TERRITORY LEGISLATION

The Arrow Bowen Pipeline will not be processed under the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland.

Arrow submitted a voluntary EIS for the Arrow Bowen Pipeline to the Chief Executive of DERM (now DEHP) on 16 December 2011 in accordance with the requirements of Chapter 3 of the EP Act. The EIS contains commitments made as to the management of environmental impacts during the construction and operation of the pipeline through an EMP contained within the EIS (Chapter 5).

Although the EIS for the Arrow Bowen Pipeline has been developed at Arrow's initiative as a voluntary submission, it conforms to the principles and standards of the EP Act.

The EIS will form the basis of the information required for a Petroleum Pipeline Licence (PPL) application for a Level 1 EA.

The EIS will be of particular interest to a number of stakeholder groups including:

- Commonwealth and state regulatory agencies and relevant government departments;
- Local councils along the proposed pipeline route;
- Landholders, leaseholders, easement holders, native title claimants, residents and business interests along the proposed pipeline route;
- Environmental groups;

- Cultural heritage interests; and
- Mining and petroleum tenement holders.

Consultation with these stakeholder groups has been undertaken and will be on-going throughout the project.

The EIS satisfies the Terms of Reference (TOR) that were prepared in consultation with DERM (now DEHP) and issued on 7 July 2011. DERM issued a Notice to Proceed, triggering public notification of the EIS, on 24 February 2012. As a central part of the EIS process, the public are invited to review the EIS and provide comment during the submission period from 26 March to 24 May 2012. Each stakeholder's input will inform the final planning for the project and facilitate community understanding and support for the project.

2.6. PUBLIC CONSULTATION (INCLUDING WITH INDIGENOUS STAKEHOLDERS)

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.

The SCP will be maintained for the duration of the planning, construction and commissioning phases of the project. Arrow will maintain an active stakeholder liaison program during the operational phase.

In accordance with the SCP, Arrow has undertaken consultation (and is continuing to undertake consultation) with a range of stakeholders for the project, including affected landholders, government agencies and local government. While other interested parties may be identified as the project is progressed, key stakeholders already identified are outlined in **Table 2-2**.

Consultation methods to be used throughout the project development, in accordance with the SCP, include:

- One-on-one meetings with local governments, relevant government departments and agencies (including regional offices), Member of Parliament representing the area (state and Commonwealth), landholders, residents, indigenous interests, community groups, business groups and special interest groups;
- Individual face-to-face consultations and negotiations with landholders and residents, which are ongoing for the life of the project;
- Preparation and wide distribution of printed digital information, factsheets, project updates and special reports;
- Establishment of a database of key stakeholders to advise of progress, to note, and monitor concerns and to open and maintain communication channels;

- Use of local newspapers and community announcements to disseminate information at key points in the project;
- Internet access to project information;
- Community sessions along the proposed pipeline route as appropriate during planning and EIS public comments period; and
- Regular project group planning and information sharing meetings.

Table 2-2: Stakeholders for the project

Category	Entity
State government advisory agencies and elected representatives	Department of Environment and Heritage Protection
	Department of State Development, Infrastructure and Planning
	Department of Transport and Main Roads
	Department of Natural Resources and Mines
	Department of Communities, Child Safety and Disability Services
	Department of Community Safety
	Queensland Police Service
	Department of Education, Training and Employment
	Queensland Health
	State and Commonwealth Members of Parliament
	Whitsunday Regional Council
	Isaac Regional Council
	Rockhampton Regional Council
Gladstone Regional Council	
Community associations and landcare groups	Capricorn Conservation Council Inc.
	Fitzroy Basin Association
	Gladstone Economic and Industry Development Board
	Mackay Conservation Group
	Queensland Conservation Council
	Calliope Landcare
	Yarwun Targinnine Progress Association
Mackay-Whitsunday-Isaac Regional Economic Development Corporation	
Registered Native Title parties	Birri People (QUD6244/98, QC98/12)
	Jangga People (QUD6230/98, QC98/10)
	Wiri People (QUD372/06, QC06/14)
	Barada Barna People (QUD380/08, QC08/11)
	Darumbal People 2 (QUD6001/99, QC99/1)
	Darumbul People (QUD6131/98, QC97/)

Category	Entity
	Port Curtis Coral Coast People (QUD6026/01, QC01/29)
Other LNG proponents	Queensland Gas Company (QGC) / British Gas (BG)
	Santos / PETRONAS and TOTAL
	Origin Energy / Conoco Philips
Petroleum and mineral tenement holders	CH4 Pty Ltd (PL)
	Central Queensland Pipeline Pty Ltd (PPL)
	Stanwell Corporation Limited (PPL)
	Jemena Queensland Gas Pipeline (1) Pty Ltd (PPL)
	QCLNG Pipeline Pty Ltd (PPL)
	Surat Gladstone Pipeline Pty Ltd (PPL)
	Peabody (Burton Coal) Pty Ltd (ML)
	Vale Australia (CQ) Pty Ltd (ML)
	Coppabella Coal Pty Ltd (ML)
	Macarthur Coal Pty Ltd (ML)
	Xstrata plc.
	BHP Billiton Ltd.
	Aquila
Operators of existing utilities and infrastructure	Ergon Energy
	Powerlink
	Optus
	Telstra
	Queensland Rail (passenger) and Queensland Rail National (freight)
	SunWater
	Gladstone Ports Corporation / Central Queensland Port Authority
Landholders	All affected landholders along the proposed pipeline route

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. Ongoing communication and consultation with landholders about construction activities, land access protocols and environmental management measures will help to reduce uncertainty for property owners about the use of land and help to ensure that construction of the pipeline minimises impacts on farming activities and operations. Consultation and communication with property owners during operation will also help to minimise potential property impacts associated with access by maintenance vehicles.

Consultation with property owners undertaken by Arrow identified a number of concerns of property owners about potential property impacts and disruption to existing farming operations from the proposed pipeline's construction and operation. These included impacts

resulting from the potential spread of weeds between properties and land access issues such as the number of people accessing the property and potential for gates to be left open or fences damaged. The implementation of appropriate management and mitigation measures and land access protocols identified in the EMP will minimise potential impacts on property and farming operations during the construction and operation of the proposed pipeline.

Concerns were also raised by property owners about potential impact on property values and potential for loss of income due to the construction of the proposed pipeline. Given the short term nature of the project and its impacts on properties, the project is not likely to change property values or marketability of properties in areas near the project.

Arrow has contacted and will continue to consult with all landholders affected by the proposed pipeline. A Stakeholder Consultation Plan (SCP) 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.

A range of searches of the register of native title claims maintained by the NNTT have been made for the purposes of determining which groups constitute the Aboriginal parties for cultural heritage issues and how much of it lies within their claim area.

On the basis of criteria specified in section 34 and 35 of the ACH Act, the following currently registered native title claims (in alphabetic order) have standing as exclusive Aboriginal parties for that portion of the project that falls within their claim boundaries. Approximately 87% of the proposed pipeline route falls into this category:

- Barada Barna (QC08/11, QUD380/08);
- Birri (QC98/12, QUD6244/98);
- Darumbal People (QC97/21, QUD6131/98);
- Darumbal #2 (QC99/1, QUD6001/99);
- Jangga (QC98/10, QG6230/98);
- Port Curtis Coral Coast (QC01/29, QUD6026/01); and
- Wiri People Core Country Claim (QC06/14, QUD372/06).

The following also have the status of exclusive Aboriginal parties that lie within an unregistered claim, but do not overlap with any currently registered claim. Approximately three % of the proposed pipeline route falls into this category:

- Southern Barada & Kabalbara (QC00/4, Q60004/00);
- Wiri #2 (QC98/11, QG6251/98); and

- Barada Barna Kabalbara & Yetimarla People (QC01/13, QUD6011/01).

The Barada Barna Kabalbara and Yetimarla People claim overlaps with a section of the Wiri #2 claim.

No native title claim has been registered on three sections of the proposed pipeline route. The areas extend for a distance of 63 km, or just over 10% of the project area and fall between the registered claim areas for:

- Barada Barna and Darumbal People;
- Darumbal and Darumbal People #2; and
- Darumbal and Port Curtis Coral Coast People.

Arrow Energy has concluded ILUAs with the following registered native title parties for the relevant parts of the project which traverses land or waters in which they assert an interest:

- Birri People (QUD6244/98, QC98/12);
- Jangga People (QUD6230/98, QC98/10);
- Wiri People (QUD372/06, QC06/14); and
- Barada Barna People (QUD380/08, QC08/11).

Authorised ILUAs with all of the above groups have been presented to the NNTT for registration, which is anticipated before the end of 2011.

Active negotiations towards ILUAs are continuing with two additional registered Native Title parties:

- Port Curtis Coral Coast People (QUD6026/01, QC01/29); and
- Darumbul People (QUD6131/98, QC97/21 and QUD6001/99, QC99/1)

It is anticipated that a voluntary agreement will be concluded with the above two groups in the near future.

For the three areas of the project which are not subject to a current NTDA, Arrow has engaged in a process of enquiry and public notification to identify the relevant Native Title parties. In some cases, there were formally registered Native Title claimants for the areas in question. Relevant parties have been identified for each of these areas, and negotiations towards ILUAs and cultural heritage agreements have commenced.

2.7. A STAGED DEVELOPMENT OR COMPONENT OF A LARGER PROJECT

The Arrow Bowen Pipeline will link Arrow Energy's gas fields in the Bowen Basin to a proposed Arrow Energy GGH in the Aldoga precinct of the Gladstone State Development Area (GSDA) to Arrow Energy's proposed Arrow LNG Plant on Curtis Island.

The proposed Arrow LNG Plant provides an opportunity for Arrow Energy to commercialise its gas for LNG export. An EIS under the SDPWO Act has been prepared by Arrow Energy for the proposed LNG facility on Curtis Island, a gas pipeline from the mainland to the LNG Plant on Curtis Island (via a tunnel), construction of marine facilities, and minor dredging within Port Curtis facilitate access to Arrow Energy launch sites and material offloading facilities. The EIS was submitted to the Coordinator General in late 2011. 2009. LNG Plant Project (formerly the Shell Australia LNG Project) - An EPBC Referral (2009/5007) was submitted in July 2009. This proposed LNG export facility on Curtis Island will have a base-case capacity of 16 million tonnes per annum (Mtpa), with a total plant capacity of up to 18 Mtpa. This project is a controlled action under the EPBC Act.

The proposed upstream gas field development in the Bowen Basin is located between Collinsville in the north and Middlemount in the south, approximately 475 km north of Brisbane and 75 km south of Mackay. It will see the staged development of Arrow Energy's tenures adjacent to the existing Moranbah Gas Project which is one of the largest operating CSG projects in Australia. An EIS for the Bowen Basin Project commenced in early 2012 with an Initial Advice Statement (IAS) proposed to be submitted to DEHP in the first quarter of 2013. An EPBC referral was submitted on 9 May 2012 (2012/6377) with a determination of 'controlled action'. The proposed project involves the development of coal seam gas production infrastructure in an area that extends from 30 km north of Glenden to 10 km south of Blackwater.

ARROW ENERGY ACREAGE POSITION

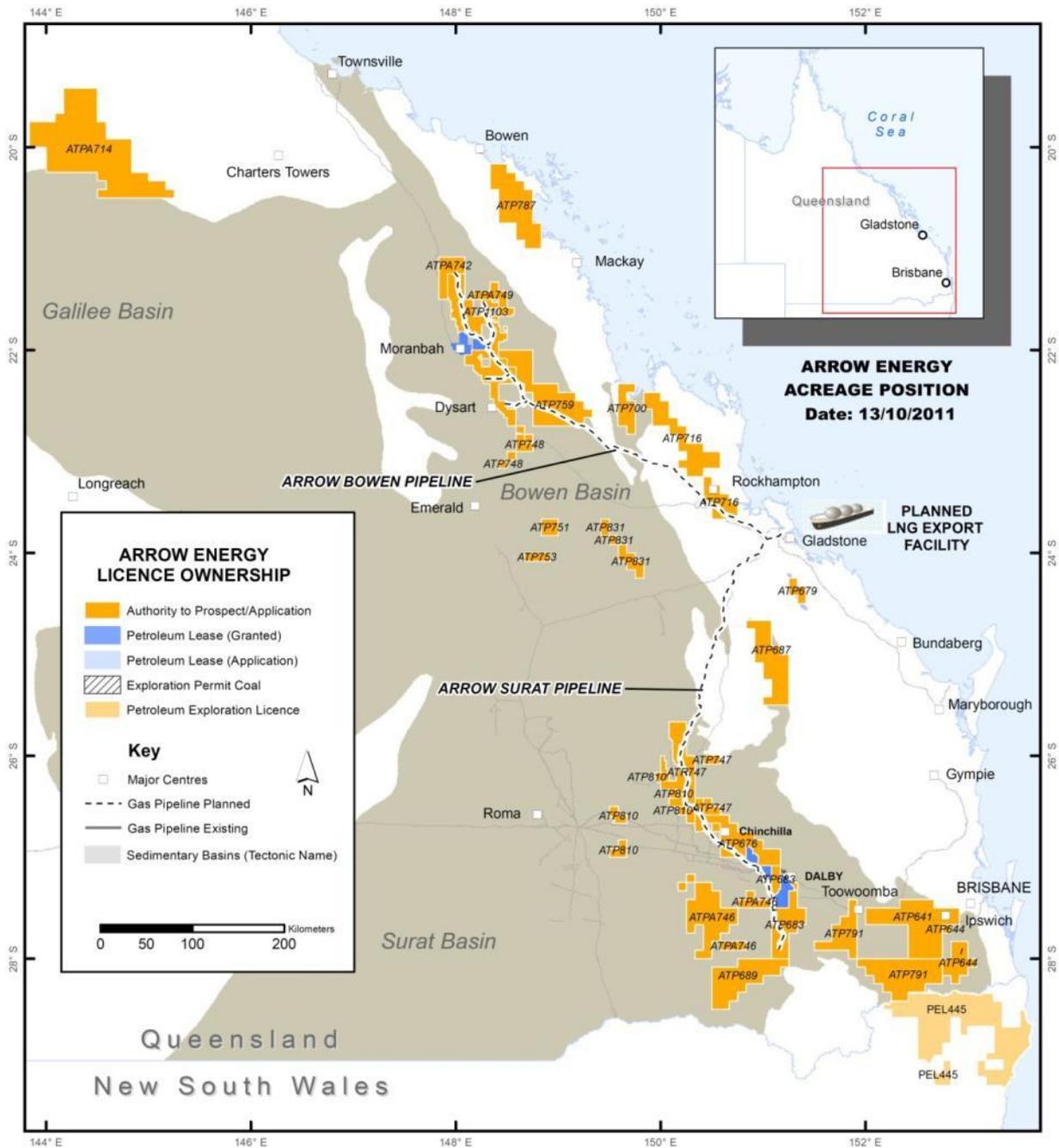


Figure 2-2: Arrow Energy's acreage position and CSG assets in Queensland

3. DESCRIPTION OF ENVIRONMENT AND LIKELY IMPACTS

3.1. MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

This section focuses on MNES likely to be affected by project, being 3.1(d) *Listed threatened species and ecological communities* and 3.1(e) *Listed migratory species*.

3.1.1. 3.1(D) LISTED THREATENED SPECIES AND ECOLOGICAL COMMUNITIES

3.1.1.1. Methodology

The assessment of listed threatened species and ecological communities is based on a desktop assessments and field surveys.

Desktop assessments included a review of data and mapping provided by Queensland Herbarium HerbreCs, DERM Wildnet and EPBC Protected Matters Search, (sourced in December 2010), Queensland Museum Zoology data, Directory of Important Wetlands and DSEWPC Protected Matters Search and Queensland Government's Environment and Resource Management Wetland Info data.

Field surveys were conducted along the proposed 40 m ROW and included:

- Terrestrial flora field surveys - conducted from 14 June to 4 August 2011 (winter survey), 29 August to 11 September 2011 (spring survey), and 4 December to 12 December 2011 (summer survey) and again from 10 to 19 April 2012.
- Terrestrial fauna field surveys - conducted from 14 June to 3 July 2011 (winter survey), 5 September to 20 September 2011 (spring survey), 4 December to 12 December 2012 (summer survey) to account for different seasonal conditions.
- Aquatic field survey - conducted from 12 September to 24 September 2011 (spring survey).

3.1.1.2. Results

Flora Species

A search of the Queensland Herbarium (QH), Wildnet (W) and EPBC databases identified 18 EPBC listed flora species within the project area, as identified in **Table 3.1**.

Table 3-1: EPBC flora species potentially occurring in the vicinity of the proposed pipeline route

Scientific name	Status*	Recorded within the route during field surveys	Source~
	EPBC		
<i>Bosistoa transversa</i> (syn. <i>B. selwynii</i>)	V	-	EPBC
<i>Corymbia xanthope</i>	V	-	W
<i>Cossinia australiana</i>	E	-	EPBC
<i>Cupaniopsis shirleyana</i>	V	-	EPBC
<i>Cycas megacarpa</i>	E	-	QH, W
<i>Cycas ophiolitica</i>	E	-	EPBC
<i>Dichanthium queenslandicum</i>	V	-	QH, W
<i>Dichanthium setosum</i>	V	-	QH, W
<i>Digitaria porrecta</i>	E	-	EPBC
<i>Eucalyptus raveretiana</i>	V	Yes	QH, W
<i>Graptophyllum ilicifolium</i>	V	-	W
<i>Lepidium hyssopifolium</i>	E	-	W
<i>Leucopogon cuspidatus</i>	V	-	EPBC
<i>Ozothamnus eriocephalus</i>	V	-	QH, W
<i>Pimelea leptospermoides</i>	V	-	QH, W
<i>Pultenaea setulose</i>	V	-	QH, W
<i>Quassia bidwillii</i>	V	-	EPBC
<i>Taeniophyllum muelleri</i>	V	-	EPBC

Note: E - Endangered, V - Vulnerable, NT - Not Threatened.

***Eucalyptus raveretiana* (black ironbox)**

Description

Essential habitat for *Eucalyptus raveretiana* (black ironbox), which is listed as Vulnerable under both the NC Act and the EPBC Act, occurs within the 5 km buffer area and within the ROW. The ROW contains 0.7 ha of essential habitat mapped by DERM (now DEHP) near the crossing of Limestone Creek from AB 369.2 to 370. This species occurs along rivers, creeks and watercourses on clay and loam soils. According to DSEWPC (2010b), the distribution of the species overlaps with three EPBC-listed EECs (Brigalow, semi-evergreen vine thickets and natural grasslands of the Queensland central highlands and the northern Fitzroy basin). Field surveys recorded black ironbox from one occurrence of essential habitat from AB 370.0 to 370.1

Black ironbox (**Plate 3-1**) is a vulnerable species that was recorded along watercourse crossings containing RE 11.3.25 from AB 348 to 382. Populations were recorded at or adjacent to four watercourse crossings within the ROW:

- Two Mile Creek (AB 348);
- Limestone Creek (AB 370) - this area is also mapped as essential habitat for black ironbox;
- Deep Creek (AB 372); and
- Lion Creek (AB 381.5).



■ **Plate 3-1 *Eucalyptus raveretiana* (black ironbox) on Two Mile Creek at AB 349.2**

Nature and extent of likely impact

The proposed alignment transects two areas mapped by DEHP as essential habitat for *Eucalyptus raveretiana* (black ironbox). Populations of this eucalypt were recorded within one section of the mapped essential habitat at Limestone Creek from AB 369.2 to 370.1. Although there is 0.7 ha of essential habitat for black ironbox mapped within the ROW, black ironbox and its habitat was only surveyed within 0.4 ha of the ROW along Limestone Creek. Selection of an appropriate watercourse crossing technique will minimise vegetation removal at this site.

Several populations of black ironbox were recorded within and adjacent to the ROW along four watercourse crossings containing RE 11.3.25 from AB 349 to 383.

Known and potential impacts to this species include destruction of habitat by clearing, habitat disturbance due to timber harvesting, weed invasion and smothering. Potential impacts from the pipeline construction are likely to be limited to the direct loss of plants within the ROW and associated disturbance areas (e.g. access tracks) and the introduction of weeds.

Surveys were conducted within habitat for *Eucalyptus raveretiana* along watercourse crossings between AB 349 to 383 to identify a potential route which does not contain any individuals. Results from this survey indicate that it is possible to identify a route within this section that would avoid any direct impacts on this population.

Endangered Ecological Communities

An EPBC protected matters search identified five Endangered Ecological Communities (EECs) that may occur within or adjacent to the ABP. For each EEC, the EPBC nomination recommendation lists REs that are considered to form components of the EEC (DSEWPC, 2010b). **Table 3-2** describes EECs, REs included in the EEC and areas of those REs within the ROW and 5 km buffer. The ROW contains 45.58 ha of remnant REs that form components of EECs (approximately 0.15% of the area within the 5 km buffer).

Field surveys recorded 7.36 ha of natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (RE 11.8.11), 1.08 ha of Brigalow dominant EEC (RE 11.4.8 and 11.9.1) and 0.63 ha of semi-evergreen vine thickets of the Brigalow Belt (RE 11.11.18) within the proposed 40 m ROW.

The ROW contains a maximum of 36.51 ha of remnant RE 11.3.2 (Poplar Box woodland on alluvial soils), which according to DSEWPC (2009) may contain areas of Weeping Myall (*Acacia pendula*) woodland EEC. However, the actual amount of clearing of this EEC will be less than this figure as Weeping Myall forms only a very small proportion of RE 11.3.2 and no Weeping Myall was observed in the ROW during the field surveys. Assuming no Weeping Myall is present, the total area of EEC occurring within the ROW would be 9.07 ha.

Table 3-2: EPBC Listed EECs and Equivalent REs within the ROW and the 5 km Buffer

EPBC Community Description	EPBC Act Status*	Equivalent RE	Area in ROW (ha)	Area in 5 km Buffer (ha)	% in Buffer [^]
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	E	11.3.1	0	4044.62	0
		11.4.8	0.97	851.58	0.11
		11.4.9	0	2,069.69	0
		11.5.16	0	11.38	0
		11.9.1	0.11	537.77	0.02
		11.9.5	0	1,555.66	0
		11.11.14	0	602.06	0

EPBC Community Description	EPBC Act Status*	Equivalent RE	Area in ROW (ha)	Area in 5 km Buffer (ha)	% in Buffer [^]
		11.12.21	0	28.82	0
Natural grasslands of the Qld Central Highlands and the northern Fitzroy Basin	E	11.3.21	0	770.52	0
		11.4.4	0	84.21	0
		11.8.11	7.36	5,397.11	0.14
		11.9.3	0	298.11	0
Semi-evergreen vine thickets of the Brigalow Belt	E	11.3.11	0	181.82	0
		11.4.1	0	6.67	0
		11.5.15	0	106.48	0
		11.8.13	0	571.93	0
		11.11.18	0.63	349.55	0.18
Weeping Myall Woodlands (only small component of RE)	E (where <i>A. pendula</i> dominates)	11.3.2	36.51	12,617.49	0.29
Total			45.58	30,085.47	0.15

Detailed information on the EPBC listed EEC's recorded within the project area is provided below.

Brigalow vegetation community

Description

Plate 3-2 is an example of the Brigalow community found along the pipeline alignment. Where left undisturbed, the Brigalow community is dominated by tall Brigalow but may include other species such as belah (*Casuarina cristata*), some Eucalyptus species and the Queensland bottle tree (*Brachychiton rupestris*). The understorey layer may vary from open to dense with a diverse assemblage of grass, shrub and herb species.

The proposed pipeline route originally crossed one Brigalow community (RE 11.4.8/11.9.1) near the crossing of the Isaac River between from AB 167.69 to 167.98



Plate 3-2 Brigalow woodland (RE 11.4.9) at AB93.4

Nature and extent of likely impact

Approximately 1.08 ha of Brigalow (RE 11.4.8 and 11.9.1) was originally recorded within the currently proposed 40 m ROW. However, a route realignment to the east of the Fitzroy Development Route has now avoided this small Brigalow patch.

Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (Bluegrass)

Description

The proposed pipeline route transects the Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (Bluegrass). It is listed as an Endangered ecological community under the EPBC Act. **Plate 3-3** is an example of the bluegrass grassland community found along the alignment of the pipeline.



- **Plate 3-3 Bluegrass grassland (RE 11.8.11) at AB 35.5 (EEC under EPBC Act, Of Concern biodiversity status).**

Nature and extent of likely impact

The proposed pipeline route crosses Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin in two areas – AB 35.01 to AB 36.45 and AB 36.79 to AB 37.0 as shown in **Figure A-3, Appendix 1**.

An area of approximately 7.36 ha of the community would be impacted by the ROW. This represents approximately 0.14 % of the total area of this community within a 5 km buffer of the ROW.

Semi-evergreen vine thickets of the Brigalow Belt

Description

The proposed pipeline route transects the Semi-evergreen vine thickets of the Brigalow Belt. It is listed as an Endangered ecological community under the EPBC Act.

Nature and extent of likely impact

The proposed pipeline route crosses one area of semi-evergreen vine thickets of the Brigalow Belt (11.11.18) at AB 349.55 as shown in **Figure A-3, Appendix 1**.

An area of approximately 0.63 ha of the community would be impacted by the ROW. This represents approximately 0.18 % of the total area of this community within a 5 km buffer of the ROW.

.Fauna

A search of the Queensland Museum, Wildnet and EPBC databases identified 13 Vulnerable or Endangered fauna species listed under the EPBC Act which have been recorded within 20 km of the proposed pipeline route. **Table 3.2** lists all species recorded within 20 km of the project area.

Additionally, in April 2012, populations of Koala (*Phascolarctos cinereus*) within QLD and NSW were added to the vulnerable listing under the Act.

Table 3.2: EPBC fauna species potentially occurring in the vicinity of the proposed pipeline route

Class	Scientific name	Common name	Status*	Likelihood of occurrence within project area
			EPBC Act	
Birds	<i>Erythrotriorchis radiates</i>	Red Goshawk	V	Moderate. This species may overfly the project site on occasion.
Birds	<i>Geophaps scripta scripta</i>	Squatter Pigeon	V	Present. Recorded from multiple locations on the mainline and all laterals.
Birds	<i>Epthianura crocea macgregori</i>	Yellow Chat (Dawson)	CE	Present. This species has been recorded from approximately 1.5 km north of KP449, at Twelve Mile Creek.
Birds	<i>Turnix melanogaster</i>	Black-breasted Button-quail	V	Low. Preferred vine thicket habitat is absent from project site.
Mammals	<i>Dasyurus hallucatus</i>	Northern Quoll	E	Moderate. May occur in more extensive forested areas.
Mammals	<i>Pteropus poliocephalus</i>	Grey-Headed Flying-Fox	V	Present. Extensive areas of preferred habitat present.
Mammals	<i>Xeromys myoides</i>	Water Mouse	V	Present. Recorded at a site several hundred metres east of the project site.
Mammals	<i>Phascolarctos cinereus</i>	Koala	V	Moderate. May occur in more extensive Woodland and open forest areas.
Reptiles	<i>Rheodytes leukops</i>	Fitzroy River Turtle	V	Present. Some areas of preferred habitat present on major watercourses.
Reptiles	<i>Denisonia maculate</i>	Ornamental Snake	V	Present. Small areas of suitable habitat present, but species recorded regularly in project area.
Reptiles	<i>Furina dunmalli</i>	Dunmall's Snake	V	Low. Very small number of records of this species in project area. Very

Class	Scientific name	Common name	Status*	Likelihood of occurrence within project area
			EPBC Act	
				scarce in northern limits of distribution, which occur in project area.
Reptiles	<i>Paradelma orientalis</i>	Brigalow Scaly-foot	V	High. Extensive areas of preferred habitat present.
Reptiles	<i>Egernia rugosa</i>	Yakka Skink	V	Moderate. May occur in more extensive forested areas.

Note: E - Endangered, V - Vulnerable, NT - Not Threatened. LC – Least Concern.

Of these 12 species, seven were identified within the vicinity of the proposed pipeline route during the field surveys, namely, the Squatter Pigeon (*Geophaps scripta scripta*), the Yellow Chat (*Epthianura crocea macgregori*), Grey-headed Flying Fox (*Pteropus poliocephalus*), Water Mouse (*Xeromys myoides*), Fitzroy River Turtle (*Rheodytes leukops*), Ornamental snake (*Denisonia maculate*) and Koala (*Phascolarctos cinereus*).

Squatter Pigeon

Description

The Squatter Pigeon (*Geophaps scripta scripta*) (**Plate 3-4**), listed as Vulnerable under the EPBC Act, was recorded commonly across the project area. During the field surveys, the Squatter Pigeon was recorded at 11 locations during the Winter survey, 10 locations during the Spring survey and 1 location during the Summer survey, as shown in **Figure A-3, Appendix 1**.



■ **Plate 3-4 Squatter pigeon**

Nature and extent of likely impact

The preferred habitat for the Squatter Pigeon occurs in patches throughout the pipeline corridor. The Squatter Pigeon can breed throughout most of the year and therefore no

restrictions on construction timing are required. The clearance of vegetation in intact habitat patches could contribute to loss of potential habitat and edge effects which may impact the potential habitat areas for the species. Edge effects are greatest within patches containing structurally complex vegetation such as vine thickets, Brigalow communities and riparian zones. The mobility of this species and the relatively short-term construction impacts for the pipeline suggest that this species would not be significantly affected by the project. A survey of the Squatter Pigeon nests will be undertaken prior to construction and associated vegetation clearing taking place.

Yellow Chat (Dawson)

Description

The Yellow Chat (Dawson) (*Epthianura crocea macgregori*) is listed as critically endangered under the EPBC Act. This species occurs in a small coastal area of Central Queensland within habitat consisting of marine plain wetlands. During the Summer survey, this species was not recorded within the ROW but was recorded approximately 1.5km from the proposed alignment (AB438-439) within marine plain vegetation associated with Twelve Mile Creek. However, suitable habitat that may be utilised by this species was recorded approximately 500m from the proposed alignment.

Nature and Extent of Likely Impact

Approximately 0.56 ha of Yellow Chat habitat has been recorded within the ROW. This represents approximately 0.27% of Yellow Chat habitat found within a 1 km buffer either side of the ROW.

It is unlikely the proposed alignment will have an impact on the Yellow Chat due to the distance from where this species was recorded from the proposed crossing of Twelve Mile Creek. HDD under Twelve Mile Creek will be considered subject geotechnical investigations to minimise the disturbance to habitat adjacent to the creek crossing, however minor removal of some potential habitat areas may occur. **Figure A-4** in **Appendix 1** shows the extent of potential Yellow Chat habitat to be traversed by the proposed pipeline route.

Construction activities will be programmed outside the breeding seasons for the Yellow Chat (late winter and early autumn) to avoid impacts on this species. In addition, surveys will be conducted to confirm and map the extent of any likely Yellow Chat habitat within the proximity of the proposed alignment.

Grey-headed Flying Fox

Description

The Grey-headed Flying Fox (*Pteropus poliocephalus*) is listed as Vulnerable under the EPBC Act. This species is the largest of the Australian fruit bats a highly mobile species which forages over an extensive area. It is generally found along the east coast of Australia, extending from the coast inland to the western slopes of Queensland and New South Wales.

The Grey-headed Flying Fox was recorded during the Spring surveys near Raglan Creek (AB446.5) east of the SGIC, approximately 200m from the proposed pipeline location, where a mixed flying fox camp is located. Extensive areas of preferred habitat were observed in the vicinity of the project site.

Nature and Extent of Likely Impact

This is a highly mobile species which forages over an extensive area. HDD of Raglan Creek is being proposed and as such there is not expected to be any clearing of potential Grey-headed Flying Fox habitat.

Water Mouse / False Water Rat

Description

The Water Mouse or False Water Rat (*Xeromys myoides*) is listed as Vulnerable under the EPBC Act. This species is an inter-tidal and littoral zone specialist and is currently known from three distinct regions of coastal Australia in the Northern Territory, Central Queensland and South-east Queensland. In Central Queensland, this species has been recorded in the high inter-tidal zone within closed mangrove forest and to a lesser extent, within marine grassland. One individual of this species was captured during the Summer survey within an area of *Sporobolus virginicus* associated with Inkerman Creek approximately 150m from the proposed alignment (AB430) (**Figure A-3, Appendix 1**).

Nature and Extent

Approximately 0.87 ha of Water Mouse habitat has been recorded within the ROW. This represents approximately 0.68% of Yellow Chat habitat found within a 1 km buffer either side of the ROW.

Further surveys will be undertaken to confirm and map the extent of likely Water Mouse habitat associated with Inkerman Creek. HDD under Twelve Mile Creek will be considered subject geotechnical investigations to avoid disturbance to this species during construction of the pipeline. **Figure A-5 and A-6 in Appendix 1** shows the extent of potential Water mouse habitat to be traversed by the proposed pipeline route.

Ornamental Snake

Description

The Ornamental Snake (*Denisonia maculata*) is listed as Vulnerable under the EPBC Act and is only found in the Brigalow Belt North region and parts of the Brigalow Belt South Region. The core of its distribution is found within the Fitzroy and Dawson catchments. This species feeds exclusively on frogs with preferred habitat usually consisting of Brigalow (*Acacia harpophylla*) with gilgai formations on deep cracking clay soils. The presence of deep cracking clays provides refuge for both frogs and Ornamental Snakes. The Ornamental Snake has been recorded within cleared gilgai habitat with little vegetation. This may indicate

that the species can persist in cleared areas provided the refuges in the form of cracking clays are available. During the summer survey, two live individuals were recorded along the proposed alignment between AB166 and AB167. A road-killed individual was also recorded approximately 4km south of AB203. Likely habitat for this species was also recorded at AB212-218, AB225-226 and AB232.5 (see **Figure A-7**).

Nature and Extent of Likely Impact

Approximately 52.37 ha of Ornamental Snake habitat has been recorded within the ROW. This represents approximately 1.99 % of Yellow Chat habitat found within a 1 km buffer either side of the ROW.

It is unlikely the proposed works will result in a significant impact on this species as the ROW will be kept to a minimum (30m) when working in any known or potential habitat areas, however some loss of potential habitat is expected. Additionally, there is a low potential for snakes to be directly impacted by construction traffic and trench fall during the construction period. The series of map extracts presented in **Figure A-7** shows the extent of potential Ornamental Snake habitat to be traversed by the proposed pipeline route.

Fitzroy River Turtle

Description

The Fitzroy River Turtle (*Rheodytes leukops*) is the only protected aquatic species listed as Vulnerable under the EPBC Act identified as potentially occurring within a 10 km radius of the proposed pipeline route.

The species has been found in the Fitzroy, Connors, Dawson, Isaac and Mackenzie Rivers and Windah and Devlin Creeks in flowing water and riffle characterised by well oxygenated water (Cann, 1998, Tucker *et al.*, 2001). In the dry season it may be found in large slow-flowing pools and non-flowing permanent water holes. The closest known locations to the proposed route are the Redbank and Glenroy crossings of the Fitzroy River.

A key threat to the Fitzroy River Turtle includes the trampling of nests by stock and reduced access to nesting areas due to weed infestations such as Lantana (*Lantana camara*), Cat's Claw Creeper (*Macfadyena unguis-cati*), Heart Seed Vine (*Cardiospermum grandiflorum*), and Vegetable Sponge (*Luffa aegyptiaca*).

Nature and extent of likely impact

Key threats to the Fitzroy River Turtle includes the trampling of nests by stock and reduced access to nesting areas due to weed infestations such as Lantana (*Lantana camara*), Cat's Claw Creeper (*Macfadyena unguis-cati*), Heart Seed Vine (*Cardiospermum grandiflorum*), and Vegetable Sponge (*Luffa aegyptiaca*).

Potential breeding habitat exists for the Fitzroy River Turtle at two crossing locations in the Fitzroy River (AB 234) and the Isaac River (AB 319). HDD is proposed for these river

crossings and no impacts to the Fitzroy River Turtle are expected at these sites from drilling activities. Construction activities and the provision of watercourse crossing access tracks (such as causeways and fords) have the potential to injure or disrupt the normal behaviour of the Fitzroy River Turtle. Turtle nests may be unearthed at watercourses where temporary access tracks may occur. In watercourses that are potential Fitzroy River Turtle habitat, disturbance to the sandy substrate areas of these watercourse basins and banks will not occur during the breeding season (September and October), where possible. Temporary access tracks will be sighted to avoid potential turtle habitat areas such as sandy substrate areas.

3.1(E) LISTED MIGRATORY SPECIES

Description

A search of the EPBC Act Protected Matters Search Tool identified the potential presence of 13 listed migratory bird species and one migratory reptile within a 10 km buffer of the proposed pipeline route. These species are listed in **Table 3.3** below.

Table 3-3: Migratory species records and likelihood of occurrence

Scientific Name	Common Name	Likelihood of occurrence
<i>Anseranas semipalmata</i>	Magpie Goose	High. Species utilises farm dams, rivers and ponds. Likely to be recorded.
<i>Apus pacificus</i>	Fork-tailed Swift	Moderate. Occurs at low density in the project area.
<i>Ardea alba</i>	Great Egret	Present.
<i>Ardea ibis</i>	Cattle Egret	Present.
<i>Gallinago hardwickii</i>	Latham's Snipe	Low. The preferred wetland habitats of this species are restricted in the project area.
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	Present.
<i>Hirundapus caudacutus</i>	White-throated Needletail	High. Species utilises a variety of habitat types seasonally in the project area.
<i>Merops ornatus</i>	Rainbow Bee Eater	Present.
<i>Monarcha melanopsis</i>	Black-faced Monarch	Present. The species utilises a range of moist forest types and is likely to be recorded.
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	High. The species utilises a range of moist forest types and is likely to be recorded.
<i>Nettapus coromandelianus albipennis</i>	Cotton Pygmy Goose	Present.
<i>Rhipidura rufifrons</i>	Rufous Fantail	High. The species utilises a range of moist forest types and is likely to be recorded.
<i>Rostratula benghalensis</i>	Painted Snipe	Moderate. The preferred

Scientific Name	Common Name	Likelihood of occurrence
		wetland habitats of this species are restricted in the project area
<i>Crocodylus porosus</i>	Estuarine Crocodile	Moderate. This species occurs at a low density in the Fitzroy Basin.

Six migratory species protected under the EPBC Act were recorded within the project area during the field surveys. These species include:

- Australian Cotton Pygmy Goose;
- Rainbow Bee-eater;
- Great Egret;
- Cattle Egret;
- White-bellied Sea Eagle; and
- Black-faced Monarch.

Nature and extent of likely impact

A review of relevant desktop data and completion of field surveys indicates that 12 migratory species are considered to have a moderate to high likelihood of occurrence within the proposed pipeline route or have already been recorded (all species indicated in **Table 3.4** except the Painted Snipe which has a low likelihood of occurrence).

An assessment of the potential impacts of the project on listed migratory species was undertaken and is provided in **Table 3.4**.

Table 3-4: Migratory species records and potential impacts

Scientific Name	Common Name	Potential impact	Potential to be affected by the project
<i>Anseranas semipalmata</i>	Magpie Goose	Birds of this species are completely aquatic, seldom leaving the water except to rest on logs. They spend the majority of their time floating among water lilies in deep water in pairs or small family groups and come near to the shore only to feed in the early morning and evening. They have also been recorded numerous times in the areas surrounding the proposed pipeline route wherever dams and fresh waterbodies occur. This species can move considerable distances and therefore is unlikely to be impacted by the short-term construction works in this area as there will be no impact to the waterbodies in the area.	No
<i>Apus pacificus</i>	Fork-tailed Swift	This is a highly mobile species which forages over an extensive area. Clearing or the ROW is not likely to substantially reduce available resources for this	No

Scientific Name	Common Name	Potential impact	Potential to be affected by the project
		species in the project area.	
<i>Ardea alba</i>	Great Egret	Often found with grazing animals in pastures and in shallows of freshwater wetlands. As the proposed works do not affect the habitat of this species there will be no impact on this species.	No
<i>Ardea ibis</i>	Cattle Egret	Often found with grazing animals in pastures and in shallows of freshwater wetlands. As the proposed works do not affect the habitat of this species there will be no impact on this species.	No
<i>Gallinago hardwickii</i>	Latham's Snipe	Often found in pastures and in shallows of freshwater wetlands. As the proposed works do not affect the habitat of this species there will be no impact on this species.	No
<i>Haliaeetus leucogaster</i>	White-bellied Sea Eagle	The White-bellied Sea-eagle is often seen soaring in the skies near oceans, bays and waterways or flying over the surface of waters. These sedentary birds form permanent breeding pairs and have a few favoured perch trees where they rest and roost. The main diet is fish though they also hunt tortoises, sea-snakes, waterfowl, bird nestlings and on occasions, rabbits. The nests of the birds are approximately 4 m deep and often about 30 m or more above the ground. This species was observed during field surveys.	No
<i>Hirundapus caudacutus</i>	White-throated Needletail	This is a highly mobile species which forages over an extensive area. Clearing or the ROW is not likely to substantially reduce available resources for this species in the project area.	No
<i>Merops ornatus</i>	Rainbow Bee Eater	This species is a habitat generalist and highly mobile. Impacts are likely to be minimal and temporary.	No
<i>Monarcha melanopsis</i>	Black-faced Monarch	This species is a habitat generalist and highly mobile. Impacts are likely to be minimal and temporary.	No
<i>Myiagra cyanoleuca</i>	Satin Flycatcher	This species is a habitat generalist and highly mobile. Impacts are likely to be minimal and temporary.	No
<i>Nettapus coromandelianus albipennis</i>	Cotton Pygmy Goose	The Cotton Pygmy Goose is associated with habitat types which have either been avoided by careful design and re-alignment of the proposed pipeline, or will be subject to directional drilling and not directly disturbed. Potential impacts are not considered likely to be significant.	No
<i>Rhipidura rufifrons</i>	Rufous Fantail	This species is a habitat generalist and highly mobile. Impacts are likely to be minimal and temporary.	No
<i>Crocodylus porosus</i>	Estuarine Crocodile	Crocodiles inhabit coastal rivers and swamps extending well inland via major rivers and billabongs. They are known or likely to utilise the	No

Scientific Name	Common Name	Potential impact	Potential to be affected by the project
		Fitzroy River and Raglan Creek. The short-term nature of the construction works at these river crossings would not significantly impact this species.	

The assessment undertaken for migratory species listed under the EPBC Act indicates that no migratory species would be affected by the project.

4. MEASURES TO AVOID OR REDUCE IMPACTS

The proposed pipeline alignment has been developed with the aim of minimising the potential impacts on EPBC listed species and ecological values.

4.1. FLORA

Black ironbox (*Eucalyptus raveretiana*)

Essential habitat for black ironbox was confirmed at Limestone Creek near AB 370 during field surveys. Several route revisions will be investigated to avoid populations of this species at Limestone Creek.

Further investigations will be undertaken to develop route revisions in areas where black ironbox populations have been recorded from AB 371.2 to 371.3, AB 373.3 to 373.4 and AB 382.6 to 382.8. These route revisions are described in **Table 4-1**.

Table 4-1: Proposed mitigation measure for black ironbox (*Eucalyptus raveretiana*)

KP start (km)	KP End (km)	Length (km)	Proposed mitigation measure
369.86	369.99	0.13	Modify ROW as practical. Avoid large mature trees where possible. Micro-align crossing to reduce clearing and avoid large habitat trees. Mark and avoid <i>Euc. raveretiana</i> at crossing if possible. Consider alternative crossings to avoid <i>Euc. raveretiana</i> .
372.0	372.07	0.07	Modify ROW as practical. Avoid large mature trees where possible. Micro-align crossing to reduce clearing and avoid large habitat trees. Move crossing 50m east to use 20m gap between <i>Euc. raveretiana</i> . Consider alternative crossing 380m west also without <i>Euc. raveretiana</i> .
381.34	381.43	0.17	Modify ROW as practical. Avoid large mature trees where possible. Micro-align crossing to reduce clearing and avoid large habitat trees. Move crossing 300m to NE to avoid <i>Euc. raveretiana</i> . Lantana too thick to assess other crossings further to NE

It is likely that impacts to black ironbox species can be avoided, so offsets would not be required for this species.

Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (Bluegrass)

The proposed pipeline route crosses Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin in two areas - AB35.01 to AB36.45 and AB 36.79 to 37.0 as shown in **Figure A-4, Appendix 1**.

The proposed pipeline route crosses Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin in two areas - AB35.01 to AB36.45 and AB 36.79 to 37.0.

An area of approximately 7.36 ha of the community would be impacted by the ROW. This represents approximately 0.14 % of the total area of this community within a 5 km buffer of the ROW.

All practicable efforts will be made to avoid and minimise impacts on Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin during construction and operation of the proposed pipeline. Where residual impacts cannot be avoided, reseeding of the grassland will be implemented to rehabilitate vegetation similar to that of the impacted vegetation in a nearby location.

Semi-evergreen vine thicket)

The proposed pipeline route crosses semi-evergreen vine thicket at one location – AB 365.91 to 357.06. An area of approximately 0.63 of this community (RE 11.11.18) is located within the proposed 40 m ROW.

Realignment of the pipeline to the northeast at this location is being considered to avoid this community.

Weeping Myall (*Acacia pendula*) Woodlands

As no Weeping Myall Woodlands were identified during the field surveys, it is unlikely that the community exists within the ROW.

The ROW contains a maximum of 36.51 ha of remnant RE 11.3.2 (Poplar Box woodland on alluvial soils), which according to DSEWPC (2009) may contain areas of Weeping Myall (*Acacia pendula*) woodland EEC. However, the actual amount of clearing of this EEC will be less than this figure as Weeping Myall forms only a very small proportion of RE 11.3.2 and no Weeping Myall was observed in the ROW during the field surveys. Assuming no Weeping Myall is present, the total area of EEC occurring within the ROW would be 9.07 ha.

4.2. FAUNA

Squatter Pigeon

Due to the mobility of the Squatter Pigeon and the short-term impacts associated with the construction of the pipeline, the species would not be significantly affected by the project. A survey of the Squatter Pigeon nests would be undertaken as construction takes place in the nesting season. Furthermore, any construction within the vicinity of Twelve Mile Creek will occur outside the breeding season of this species which is between late winter and early autumn.

Ornamental snake

The ROW will be kept to a minimum when working in any known or potential ornamental Snake habitat areas. Additionally, trenches will be regularly checked by experienced personnel every morning to check for Ornamental Snakes that may have fallen into the

trench, overnight. If any snakes are detected in the trenches, they will be safely captured and released into suitable habitat a safe distance from where the works are occurring

Yellow Chat (Dawson)

It should be noted that this species was recorded approximately 1.5 km north of the proposed alignment and the nearest area of potential habitat is approximately 0.5 km from the proposed alignment. Impacts to wetland areas will be minimised through avoidance, HDD where appropriate, dry season construction scheduling and post construction habitat rehabilitation where required. In addition, surveys will be conducted to confirm and map the extent of any likely Yellow Chat habitat within proximity of the proposed alignment.

Water Mouse/False Water Rat

This species was recorded approximately 300 m north of the proposed alignment and potential habitat has been identified approximately 150 m north of the proposed alignment. However, to minimise any potential impacts on this species, Horizontal Directional Drilling is proposed under Inkerman Creek and any associated areas that contain marine vegetation i.e. mangroves, salt couch. Additionally, all entry and activities will be conducted outside areas containing any marine vegetation.

Fitzroy River Turtle

The following measures will be undertaken to minimise impacts to the Fitzroy River Turtle as a result of the project:

- A preconstruction survey will be conducted to identify potential turtle nests in the sandy areas of the lower Fitzroy catchment and the Isaac River;
- Subject to geotechnical investigation, HDD construction methods will be employed at the Isaac River (AB 234) and the Fitzroy River (AB 319) crossings;
- In watercourses that are potential Fitzroy River Turtle habitat, disturbance to the sandy substrate areas of these watercourse basins and banks should not occur during the breeding season (September and October);
- Temporary access tracks across the sandy areas of the stream bed and banks of the Isaac River and the Fitzroy River will be avoided unless a prior turtle survey has been undertaken. Should access crossing be required, a temporary bridge or other mechanism to avoid disturbance to these sandy banks and sandy stream beds (particularly in the vicinity of the landholder crossing of the Fitzroy River) or use of alternative road crossings such as the Glenroy Road Crossing south of the alignment at the Fitzroy River should be used.
- It is important to maintain drainage patterns, and water quality in regions where the Fitzroy River turtle occurs, including areas adjacent to, or higher up the river bank of these areas. Care should be taken during construction of the pipeline to ensure that adjacent areas, and nearby uphill areas in the Fitzroy region are not accessed by construction crews, particularly during the Spring breeding season.

4.3. MIGRATORY SPECIES

As no migratory species would be affected by the project, no mitigation measures have been proposed.

5. CONCLUSION ON THE LIKELIHOOD OF SIGNIFICANT IMPACTS

The listed ecological communities and threatened species potentially impacted by the project include:

- Black ironbox (*Eucalyptus raveretiana*);
- Brigalow (*Acacia harpophylla*);
- Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (Bluegrass);
- Weeping Myall Woodlands (*Acacia pendula*);
- Squatter Pigeon (*Geophaps scripta scripta*);
- Yellow Chat (*Epthianura crocea macgregori*);
- Fitzroy River Turtle (*Rheodytes leukops*);
- Ornamental snake (*Denisonia maculate*); and
- Water Mouse/False Water Rat (*Xeromys myoides*).

Due to the mobility of the Squatter Pigeon and the relatively short-term construction impacts for the pipeline, this species would not be significantly affected by the project. A survey of the Squatter Pigeon nests would be undertaken as construction takes place in the nesting season.

Approximately 0.84 ha of Brigalow RE 11.3.1, 0.5 ha of Brigalow RE 11.4.9 and 4.99 ha were recorded within the existing ROW, and would have been cleared during construction. However, realignment of the pipeline has now avoided this community and therefore significant residual impacts are unlikely. In addition, no clearing of Brigalow or Brigalow regrowth will be conducted outside the ROW.

Approximately 4.99 ha of Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin RE 11.8.11 are located within the ROW, and would be cleared for construction activities. While all practicable efforts will be made to avoid and minimise impacts on Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin, it is likely that small areas will be cleared or disturbed for construction and operation of the proposed pipeline. Where residual impacts cannot be avoided, reseeding/replanting of this community will be implemented to rehabilitate vegetation similar to that of the impacted vegetation in a nearby location.

Areas of essential habitat and several populations of Black Ironbox were recorded within and adjacent to the ROW. Further investigations will be undertaken to develop route revisions in areas where black ironbox populations or essential habitat for the species have been recorded.

Potential breeding habitat exists for the Fitzroy River Turtle at two crossing locations in the Fitzroy River and the Isaac River. HDD will be used at significant watercourse crossings (subject to geotechnical verification) and no impacts to the Fitzroy River Turtle are expected from drilling activities at the sites.

Six migratory species protected under the EPBC Act were recorded within the project area during the field surveys. These species include:

- Australian Cotton Pygmy Goose;
- Rainbow Bee-eater;
- Great Egret;
- Cattle Egret;
- White-bellied Sea Eagle; and
- Black-faced Monarch.

The assessment undertaken for migratory species listed under the EPBC Act indicates that no migratory species would be impacted by the project.

The matters protected under the EPBC Act, likely to be impacted by the construction and operation of the Arrow Bowen Pipeline, have been identified as Listed communities and threatened species (sections 18 and 18A) and Listed migratory species (sections 20 and 20A).

With the implementation of mitigation methods to avoid or minimise impacts, the ABP is not considered to have a significant impact on MNES and the proposed action is therefore not considered to be a controlled action.

APPENDIX 1: Maps

FIGURE A-1: PROJECT OVERVIEW

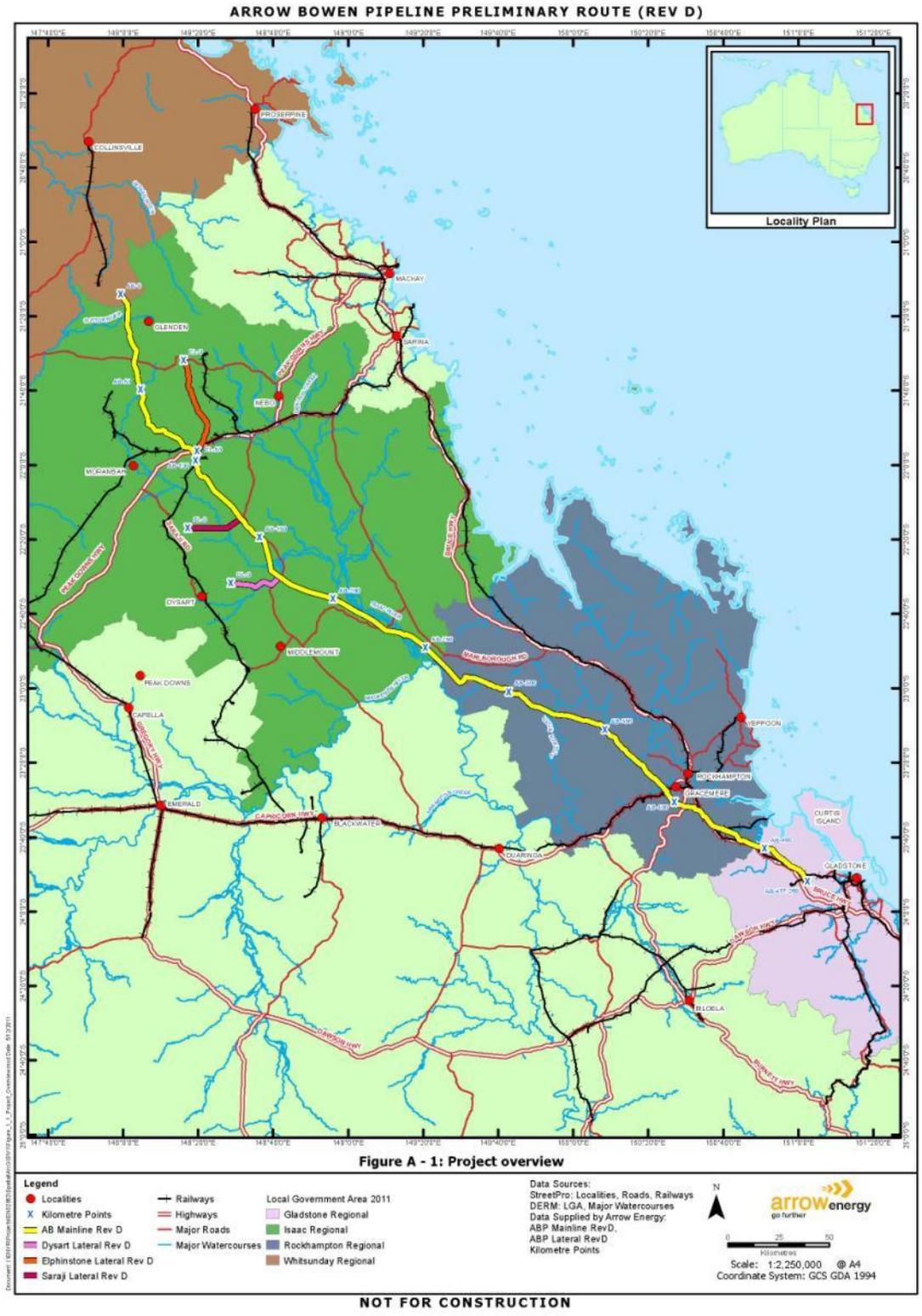


FIGURE A-2: ALTERNATIVE ROUTE OPTIONS FOR THE PROJECT

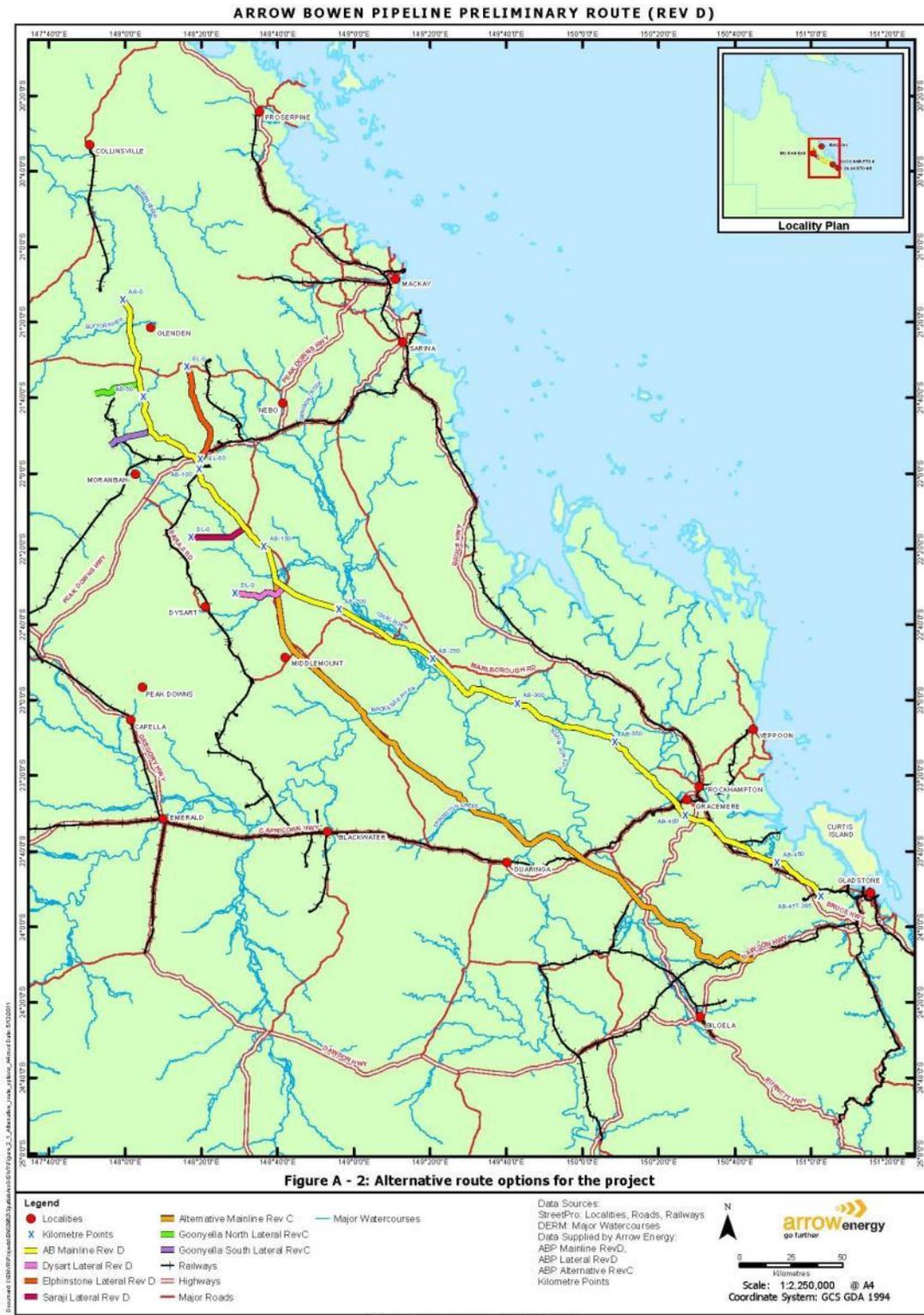
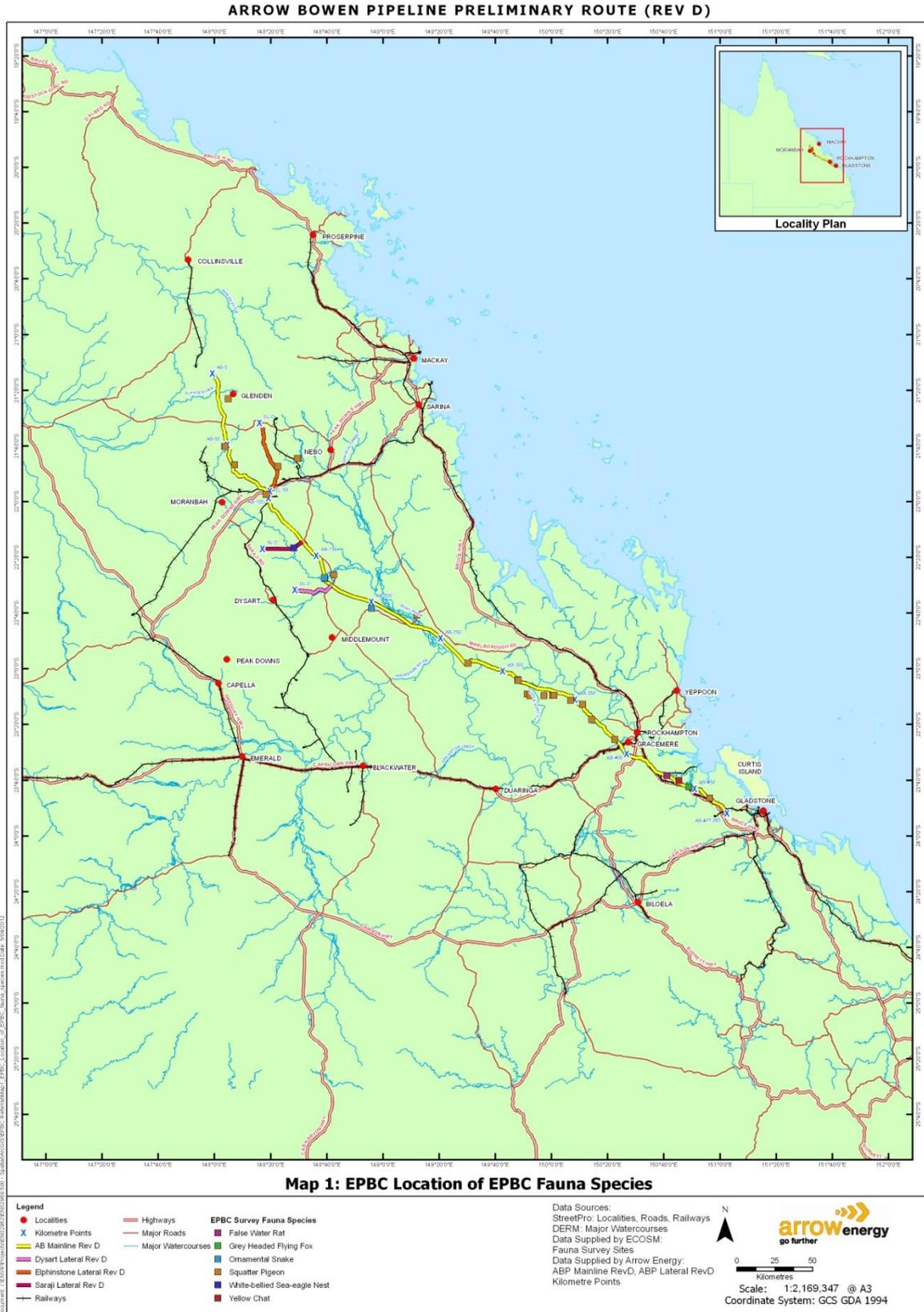
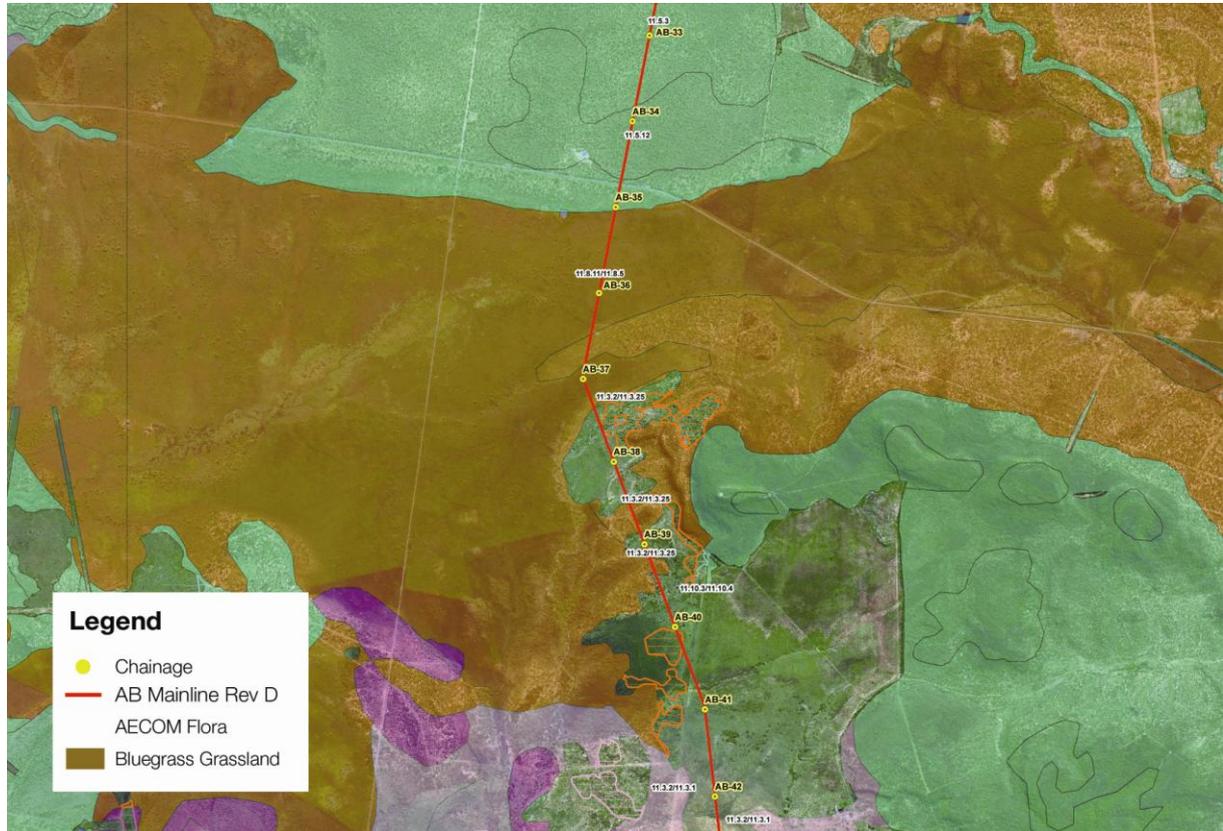


FIGURE A-3: LOCATION OF EPBC FAUNA SPECIES



NOT FOR CONSTRUCTION

FIGURE A-4: BLUEGRASS GRASSLANDS TRAVERSED BY THE PIPELINE ROUTE



**FIGURE A-5: POTENTIAL HABITAT FOR THE YELLOW CHAT
TRAVERSED BY THE PIPELINE ROUTE**

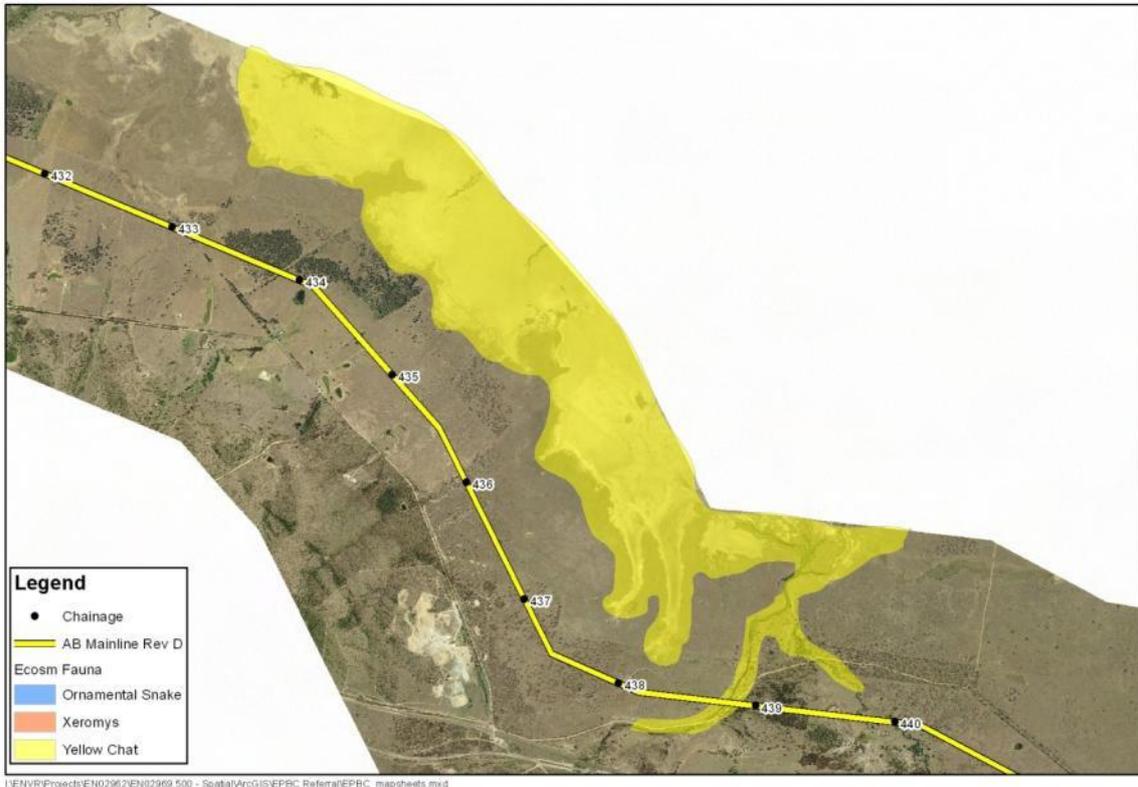


FIGURE A-6: POTENTIAL HABITAT FOR THE WATER MOUSE TRAVERSED BY THE PIPELINE ROUTE

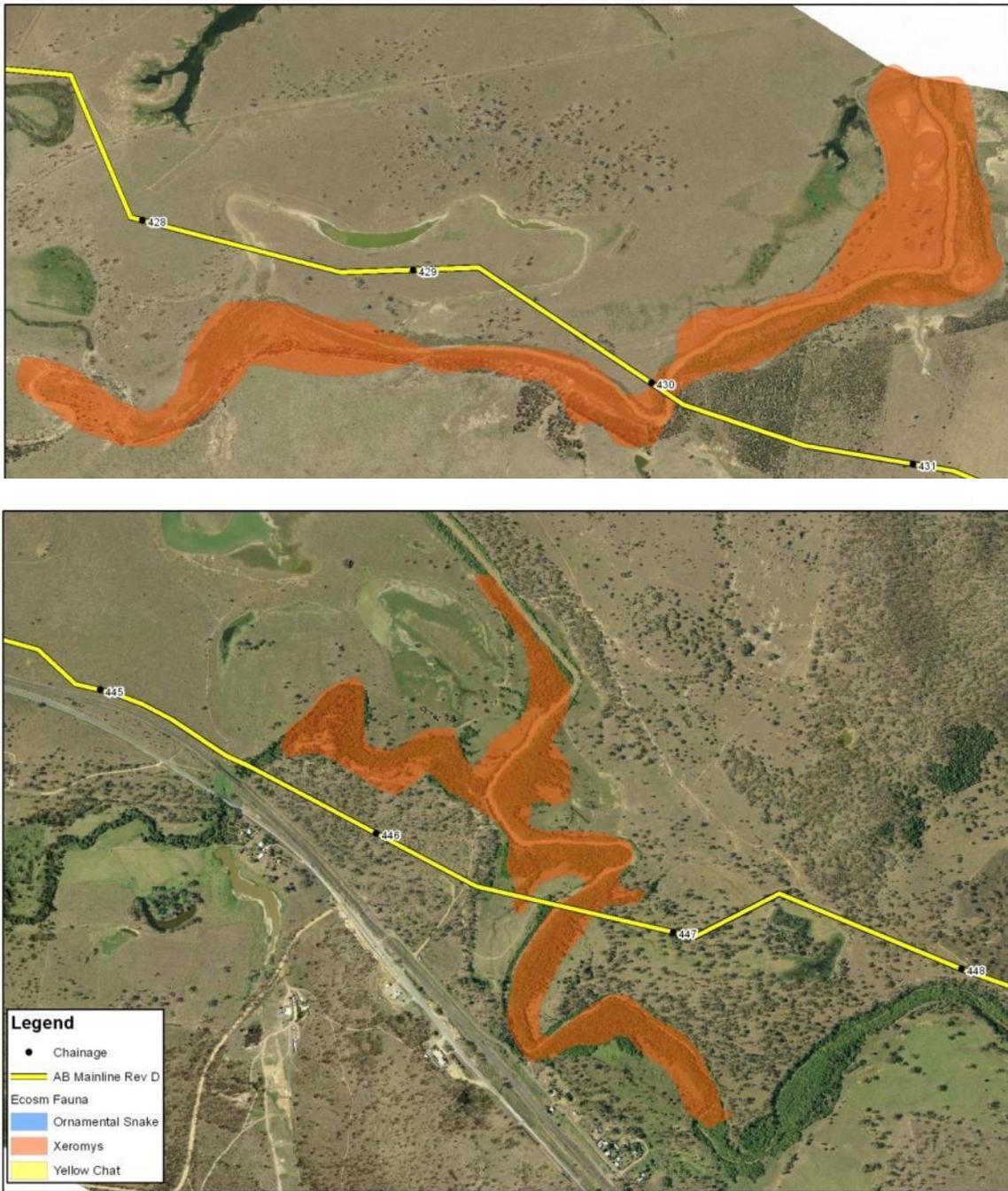


FIGURE A-7: POTENTIAL HABITAT FOR THE ORNAMENTAL SNAKE TRAVERSED BY THE PIPELINE ROUTE

