Bowen Gas Project

EPBC Species Impact Management Plan

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Document Author	Approvals Specialist
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Security Classification	Standard

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EPBC Number: EPBC 2012/6377

Project Name: Arrow Bowen Gas Project

Proponent and ABN: Arrow Energy Pty Ltd (ABN: 73 078 521 936)

Approved Action: To develop, operate and decommission a coal seam gas field in the Bowen Basin, Queensland referred under the EPBC Act on 9 May 2012; and as described in the Arrow Bowen Gas Project Environmental Impact Statement (December 2012) and Supplementary Report (June 2014).

Location of the Action: The Project covers an area of approximately 8,000 km^2 and located approximately 150 km south-west of Mackay in Queensland's Bowen Basin. The project development area extends from near the township of Glenden in the north and near Blackwater in the south.

Date of preparation of this Plan: 11 October 2018

Signed Declaration of Accuracy:

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or *Environment Protection and Biodiversity Conservation Regulation* (2000) (Cth). The offence is punishable on conviction by imprisonment or a fine, or both. I am authorised to bind the approval holder to this declaration and that I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed: .....

Full name: GRAHAM SHANN

Organisation: Arrow Energy Pty Ltd

Date: 11/10/18

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Executive Summary

Background and Purpose

- On 27 October 2014 Arrow Energy Pty Ltd (Arrow) received approval from the Australian Government to proceed with the Bowen Gas Project (BGP) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 2012/6377).
- On 5 May 2017 a 'Request to Vary Conditions of Bowen Gas Expansion Project' was submitted to the Department of the Environment and Energy (the Department) and approved on 25 March 2018. The variation authorised a staged delivery of a high level offset strategy followed by a more detailed offset plan within 12 months of project commencement.
- The purpose of this document is to satisfy the BGP approval conditions relevant to the requirement to develop and implement an EPBC Species Impact Management Plan for the BGP (i.e. Condition 9). The conditions of approval that relate to this EPBC Species Impact Management Plan (SIMP) are summarised in Table 1.1.
- The first version of this plan was submitted to the Department on 13 July 2018. This version addresses feedback received from the Department on 19 September 2018.

Key Elements

- This SIMP has been prepared by suitably qualified ecologists, with evidence of the authors' qualifications and experience provided in Appendix A.
- Arrow has undertaken comprehensive seasonal ecological surveys to gain a detailed understanding of EPBC listed threatened species and EPBC communities within the BGP area. These are summarised in the Environmental Impact Statement (EIS) (Arrow, 2012) and Supplementary Report to EIS (SREIS) (Arrow, 2014). Additional subsequent flora and fauna surveys have also been completed in the vicinity of the Project Phase 1 area in November-December 2014 (dry season survey) and March 2015 (post wet season survey). Arrow will continue to undertake flora and fauna surveys of areas proposed for development.
- This SIMP details how Arrow will meet Conditions 9a-e of the BGP approval conditions including describing the management measures and monitoring program that will be implemented to avoid, track and further minimise impacts to EPBC Act species and communities through the life of the BGP.
- As per Condition 10, Arrow will not commence Project Phase 1 until this SIMP has been approved by the Minister in writing. Once approved Arrow will implement this SIMP. This SIMP will be reviewed at least every five years (for each Project Phase) and updated if required. Any such updates will again be subject to approval by the Department/Minister.

Recommendation

That the Minister or delegate approves this Bowen Gas Project EPBC Species Impact Management Plan.

Abbreviations and Acronyms

The following table provides a list of abbreviations and acronyms used throughout this report.

Abbreviations and Acronyms

Acronym	Meaning
ATP	Authority to Prospect
BGP	Bowen Gas Project
BGP area	The areas that consist of the following Authorities to Prospect (ATPs): 1103, 1031, 1025, 749, 742 and 759
CEMP	Construction Environmental Management Plan
DotEE	Department of the Environment and Energy (Australia)
DES	Department of Environment and Science (Queensland)
EA	Environmental Authority
EIS	Environmental Impact Statement
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area as described in the *Environmental Protection Regulation 2008* (Qld)
EVNT	Flora and fauna species listed under the EBPC Act as well as species listed as extinct in the wild, endangered, vulnerable or near threatened under the *Nature Conservation Act 1992* (Qld)
FSC	Fauna spotter-catcher will be at the site on the day of clearing. The spotter-catcher will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377.
GIS	Geographic Information System
GPS	Global Positioning System
HSE	Health, Safety and Environment
MNES	Matters of National Environmental Significance as listed under the EPBC Act
RE	Regional Ecosystem
RoW	Right of Way
SIMP	EPBC Species Impact Management Plan
SMP	Arrow Energy Species Management Program for Tampering with Animal Breeding Places (which was developed for the State Department of Environment and Science (DES) in March 2018
SREIS	Supplementary Report to the Environmental Impact Statement
TEC	Threatened Ecological Community under the EPBC Act

Definitions

Term	Definition
Bowen Gas Project	Bowen Gas Project is limited to a maximum of 4,000 coal seam gas production wells and associated infrastructure. The action must not occur outside of the Authorities to Prospect (ATPs) 1103, 1031, 1025, 749, 742 and 759.
Commenced/Project Commencement	Any physical disturbance, including clearance of native vegetation, new road work and the establishment of well sites to develop the gas field project area. Commencement does not include: a) minor physical disturbance necessary to undertake pre-clearance surveys or establish monitoring programs or geotechnical investigations; or b) activities that are critical to commencement that are associated with mobilisation of plant and equipment, materials, machinery and personnel prior to the start of development only if such activities will have no adverse impact on matters of national environmental significance.
Core Habitat Known	Core habitat for a species known from recent records (since 1980) or confirmed sightings, generally buffered by a one kilometre radius. Core habitat known may also include remnant or regrowth vegetation within areas where known sightings have occurred (as defined in the rules for habitat mapping provided in Appendix B.
Core Habitat Possible	Areas of potential habitat with a number of features or values known to contribute to, or be important for the occupation of the species (as defined in the rules for habitat mapping for individual species in Appendix B).
Department	The Australian Government Department administering the EPBC Act
EPBC Act species and communities	Flora and fauna species listed as 'threatened' and vegetation communities listed as 'threatened ecological communities' under the EBPC Act at the time of the EPBC Act approval for the BGP (EPBC 2012/6377)
EPBC Act fauna species	Fauna species listed as extinct, extinct in the wild, critically endangered, endangered or vulnerable under Section 178 of the EBPC Act at the time of the EPBC Act approval for the BGP (EPBC 2012/6377)
Pre-clearance surveys	Surveys that are undertaken for flora and fauna species and communities for all areas of the project area that are to be disturbed by project activities
Project Phase	The development phases of the project which are to be a duration of no more than 5 years and confirmed by the approval holder prior to the completion of each Project Phase (as per BGP EPBC Definition).
Project Phase 1	The period of no more than 5 years from commencement (as per BGP EPBC Definition).
Significant impact	An impact that is 'significant' in accordance with the *Significant Impact Guidelines 1.1 – Matters of National Environmental Significance* (DEWHA, 2013)
Suitably Qualified Person	A person who has professional qualifications, training or skills or experience relevant to the nominated subject matters and can give authoritative assessment, advice and analysis about performance relevant to the subject matters using relevant protocols, standards, methods or literature (as per BGP EPBC Definition).

1. Introduction

Arrow Energy is a Queensland based subsidiary of Arrow Energy Holdings Pty Ltd (Arrow), a 50:50 joint venture between Royal Dutch Shell (Shell) and PetroChina Company Ltd (PetroChina). Arrow is currently developing coal seam gas resources in Queensland, including resources in the Bowen Basin.

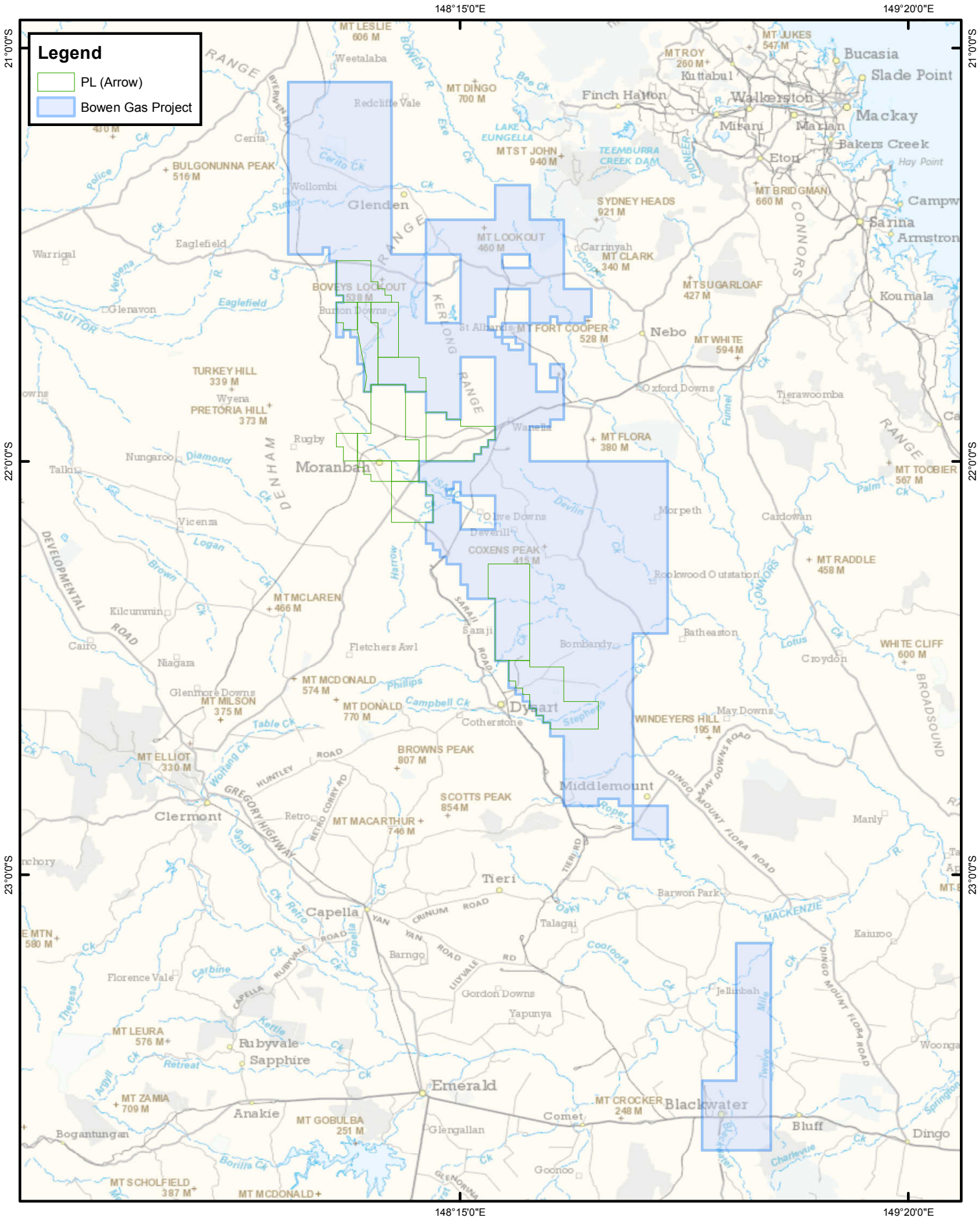
The Bowen Gas Project (BGP) was granted approval from the Queensland Government in September 2014 and the Australian Government in October 2014 for development of up to 4,000 coal seam gas production wells and associated infrastructure. The BGP covers an area of approximately 8,000 km^2, and is located south-west of Mackay, extending from Glenden in the north to Blackwater in the south (see Figure 1).

The EPBC Act approval for the BGP (EPBC 2012/6377) specifies that "*prior to the commencement of Project Phase 1, the approval holder must prepare and submit an EPBC Species Impact Management Plan for the Minister's written approval*" and that the plan must include a number of matters (Condition 9 (a) – (e) of the EPBC Act approval; refer Table 1.1 of this SIMP). The purpose of this SIMP is to satisfy these conditions.

The EPBC Act approval also identifies those EPBC Act listed species and communities (listed at the date of approval for the BGP) where a significant impact is likely, and specifies disturbance limits for each (Condition 4, Table 1 of the EPBC approval; shown in Table 1.2 of this SIMP). This SIMP addresses all of these EPBC species and communities.

For completeness, this SIMP also addresses two recently listed EPBC Act species which have been identified as having the potential to be impacted by the BGP (i.e. *Petauroides volans* (Greater Glider) and *Grantiella picta* (Painted Honeyeater)). These two species were listed under the EPBC Act subsequent to the BGP's EBPC Act approval. Although these species are discussed in this SIMP, they do not form part of the EPBC Act approval.

Table 1.1 identifies the sections within this SIMP that addresses each of the Condition 9 requirements.



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BGP Overview

Coordinate System: GCS GDA 1994

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Table 1.1 Cross-reference for Approval Condition 9 requirements and relevant sections within this SIMP

Condition Number	Condition 9 requirement	Section of this SIMP
9	Prior to the commencement of Project Phase 1, the approval holder must prepare and submit an EPBC Species Impact Management Plan for the Minister's written approval. The EPBC Species Impact Management Plan must include:	
9 (a)	Measures that will be taken to avoid, mitigate and manage impacts to EPBC listed threatened species and their habitat during clearance of vegetation, including the involvement of a suitably qualified person at all times during clearance of vegetation.	Section 3 and Appendix C
9 (b)	Measures that will be taken to avoid, mitigate and manage impacts to EPBC listed threatened species and their habitat and to EPBC communities during construction, operation and decommissioning of the action.	Section 4 and Appendix C
9 (c)	A monitoring program to determine the success of mitigation and management measures to ensure adaptive management for the duration of this approval.	Section 5 and Appendix C
9 (d)	A discussion of relevant conservation advice, recovery plans and threat abatement plans and how measures proposed in the EPBC SIMP are consistent with the measures in these documents.	Section 6
9 (e)	Details of how the approval holder has addressed any residual significant impacts to any EPBC listed threatened species and its habitat and/or EPBC communities not identified in Table 1, to be offset in accordance with the EPBC Act Environmental Offsets Policy.	Section 7

Table 1.2 Whole of project maximum disturbance limits (source: Table 1 of EPBC Act approval)

Matter of National Environmental Significance	Maximum disturbance (hectares) to core habitat known and core habitat possible
Threatened Species	
Black Ironbox (*Eucalyptus raveretiana*)	258.32
Bluegrass (*Dichanthium setosum*)	809.59
King Bluegrass (*Dichanthium queenslandicum*)	1,161.23
Ornamental Snake (*Denisonia maculata*)	1,030.31
Squatter Pigeon (*Geophaps scripta scripta*)	1,415.44
Red Goshawk (*Erythrotriorchis radiatus*)	187.14
Koala (*Phascolarctos cinereus*) (combined populations of Queensland, New South Wales and the Australian Capital Territory)	2,466.04
South-eastern Long-eared Bat (*Nyctophilus corbeni*)	2,282.57
Large-eared Pied Bat (*Chalinolobus dwyeri*)	1,451.44
Threatened Ecological Communities (TECs)	
Brigalow (*Acacia harpophylla* dominant and co-dominant)	781.16
Weeping Myall Woodlands	198.48
Natural Grasslands of the Queensland Central highlands and the northern Fitzroy Basin	871.10
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	107.42

2. Management of EPBC Species and Communities

2.1 Management hierarchy

Coal Seam Gas developments apply an iterative process in terms of locating wells and gathering lines. This is required because there are several competing constraints when it comes to locating the infrastructure on the surface. These constraints include ecological values, landholder preferences, geological features, existing infrastructure and access tracks. Planning and management of surface activities and ground disturbance is undertaken utilising a set of hierarchical management principles used to avoid, minimise and mitigate impacts to ecological values. These principles are:

- Avoid: Arrow's first preference is to avoid EPBC Act listed threatened ecological communities and the habitat of EPBC listed threatened species
- Minimise: where other competing constraints or the scale / location of EPBC communities or species habitat dictate that avoidance is not possible (e.g. where there is long linear strips of Brigalow that need to be crossed or large areas of suitable habitat for wide ranging species such as the Koala or Squatter Pigeon), Arrow will preferentially locate infrastructure in a manner that minimises the impact to these values (e.g. cross the Brigalow at the narrowest or most degraded part or where practicable on the edge of suitable habitat for listed species so as not to bisect good quality habitat)
- Mitigate: implement mitigation measures to further minimise the direct and indirect impacts on ecological values
- Remediate and rehabilitate: actively remediate and rehabilitate impacted areas to promote and maintain long term recovery
- Offset: Arrow will offset unavoidable significant residual impacts to MNES as per the BGP Offset Strategy.

2.2 Application of the management hierarchy

Sections 3 and 4 of this document provide considerable detail of Arrow's commitments to avoid, minimise and mitigate impacts to MNES. The following steps will be undertaken to implement the above mentioned management hierarchy:

- Pre-clearance surveys
- Framing trade-offs
- On-site management and reporting
- Annual reporting.

Pre-clearance surveys

Arrow has already completed ecological surveys within the areas of proposed activities. However, additional pre-clearance surveys will be undertaken when the BGP activities proceed through the detailed design and planning phase and secondary approvals are required (e.g. an Environmental Authority, Clearing Permit or a landholder agreement).

At this point in time, a field inspection of the specified disturbance footprint will be undertaken by a suitably qualified ecologist. The pre-clearance survey will confirm the presence, absence and extent of environmental values (including EPBC Act species habitats and TECs) and these will be mapped in the field via GIS. The results of this step will be recorded within Geocortex (Arrow's GIS based mapping system) and the Arrow Sharepoint site (Arrow's data compilation software used by the Access and Approvals Team).

Framing trade-offs

Following the pre-clearance surveys, a framing trade-offs meeting will be held with the project engineers, planners, ecologists, land liaison officer and an archaeologist. The purpose of this meeting is for each specialist to discuss the proposed location of the infrastructure and the opportunities and constraints based on the findings of their field assessment. It is at this meeting where the ecologist will be reiterating Arrow's management hierarchy for MNES and aiming to avoid and minimise impacts to MNES. The outcome of the framing trade-offs meeting is an agreed location for the surface infrastructure after taking into consideration each competing constraint. The results of this step will be recorded within the Arrow Sharepoint database.

On-site management and reporting

Where the framing trade-offs meeting has identified that impacts to MNES are unavoidable, the following will be undertaken so that the actual area cleared will be surveyed to quantify the impacts (in addition to the detailed measures outlined in Table 3.1):

- Record GPS coordinates of the boundary of the MNES in relation to the proposed clearing boundaries and ensure the limits of the area to be cleared are clearly marked on the ground (e.g. high visibility flagging tape, hazard netting or similar).
- Complete a Habitat Quality Assessment as per the Queensland Government Department of Environment and Heritage Protection's *Guide to determining terrestrial habitat quality – A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy* (2017).
- Ensure a fauna spotter-catcher is present during clearing. The spotter-catcher will be a suitably qualified ecologist. The number of fauna spotter-catchers on site at the time of clearing will depend on the number of machines being used at any given time.
- Record the coordinates and total area of MNES habitats and communities cleared.
- Ensure the success of on-site mitigation measures by review and assurance against this EPBC Species Impact Management Plan and the accompanying BGP EPBC Phase 1 Offset Strategy.

Annual reporting

- The field data collected above will be provided to the Environment Team at the completion of site disturbance activities and tracked monthly against approved Stage 1 maximum disturbance limits.

- This data, together with other reporting requirements specified in this plan and the accompanying BGP EPBC Offset Strategy will be collated for annual compliance reporting as per Condition 30 of the BGP EPBC approval.

2.3 Supporting Arrow documents

Arrow has been installing and operating coal seam gas infrastructure since 2005. We have numerous guiding documents relevant to the monitoring of activities that may impact species and vegetation communities; namely:

- Operations Environmental Management Plan (ORG-ARW-AOP-PLA-00016) – this document identifies the relevant procedures and other control mechanisms that are used to minimise potential environmental impacts of production operations activities and ensures the requirements of relevant legislation are met.

- Biodiversity Standard (ORG-ARW-HSM-STA-00034) – the intent of this document is to ensure the protection of biodiversity (flora, fauna and natural habitats) in the areas in which Arrow operates in recognition of the value of healthy and functioning terrestrial and aquatic natural systems. The Standard places a responsibility on all Arrow line managers and contractors to monitor potential biodiversity impacts and controls.

- HSE Incident Management Standard (ORG-ARW-HSM-STA-00007) and the Incident Management Procedure (ORG-ARW-HSM-PRO-00089) – these documents specify the process for reporting, recording, classifying, notifying and investigating unplanned events and incidents that have resulted in damage to the environment.

Beyond the above mentioned overarching documents, two Arrow procedures are particularly relevant:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing. Clearing extents will also be input into an Arrow database to track EPBC Act species and community disturbance against approved limits on a monthly basis.

- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:

  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed

threatened (including EPBC Act listed species), near threatened and special least concern fauna).

- Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist).
- Regularly monitor mitigation measures that have been constructed and/or implemented (e.g. fauna exclusion fences) and report their effectiveness to the Site Supervisor.
- Provide clear communications on any ongoing action requirements (e.g. monitoring and maintenance) during site handover processes, and these must be implemented, monitored and their effectiveness reported.

3. Mitigation measures during clearance of vegetation

Condition 9(a): Measures that will be taken to avoid, mitigate and manage impacts to EPBC listed threatened species and their habitat during clearance of vegetation, including the involvement of a suitably qualified person at all times during clearance of vegetation.

Many of the mitigation measures that will be undertaken to avoid or reduce impacts to EPBC species and communities during clearance of vegetation are consistent with relevant BGP EIS mitigation commitments (see Appendix O of the Supplementary EIS for the full list of Arrow's mitigation commitments for the BGP). The relevant commitments are listed in Table 3.1 (with the BGP EIS commitment number provided in parenthesis).

Further to the commitments provided within the BGP EIS and reproduced below, a number of other mitigation measures included within the Arrow Energy Species Management Program for Tampering with Animal Breeding Places (which was developed for the State Department of Environment and Science (DES) in March 2018) are of relevance and have been included in the list below. These measures are marked 'SMP'.

The particular mitigation measures that relate to each individual EPBC Act species and community are identified in the individual species and community profiles provided as Appendix C.

Measures that will be implemented by Arrow to address Condition 9(a) are presented in Table 3.1.

Table 3.1 Description of mitigation measures / commitments for clearing activities

Mitigation	Commitment	Intended outcome	Responsible manager/s
Pre-construction clearance surveys / minimise clearing	• When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database (new commitment). • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that EPBC species or community habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked (new commitment). • The disturbance footprint and vegetation clearing will be minimised (B017). • The land cleared for construction purposes will be kept to the minimum necessary, especially during the drier months of the year (B018). • Land disturbance will be minimised with the smallest practical area of land being disturbed in the shortest practicable time (B047). • All operations will be planned to ensure minimal damage on any vegetation, cropping or pasture areas outside the limits to be cleared (B050). • Disturbance within the following areas will be avoided where possible (part of B131): – Endangered EPBC Act TECs: Brigalow Ecological Community; Natural Grasslands Ecological Community; Semi-evergreen Vine Thicket Ecological Community; Weeping Myall Woodlands). – Core habitat for EVNT species. • Pre-clearance surveys will be conducted to identify any additional areas that need to be avoided. As a minimum, these will include (B132): – vegetation mapping at a scale suitable for site-specific planning. – identification of core habitats for EVNT species. – identification of site-specific sensitive areas (e.g. ESAs) that require avoidance or buffers. • Wells, gathering lines and access tracks will be located within previous clearings or non-remnant vegetation if possible (B133).	• To identify opportunities where the residual impacts to MNES matters can be further reduced	• BGP Pre-execution (i.e. Planning) Manager (Arrow)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134). • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135). • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136). • Habitat trees will be retained where practicable (B137). • Removal of riparian vegetation will be avoided where practical by use of directional drilling and/or reduction of right of ways (B138). • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140). • Sensitive infrastructure design principles will be applied to avoid watercourse, drainage lines and riparian areas where practicable (B142). • Pre-clearance surveys will be undertaken to determine the likelihood of the species (including weeds) occurring (B155). • Where EVNT species are identified in proposed development areas, consideration will be given to mitigation measures such as translocation and/or propagation of flora species. Progress of any translocation programs will be monitored in accordance with the relevant translocation management plans (B169). • The width of construction RoWs will be minimised within areas of sensitivity to the greatest extent practicable without compromising the safety of workers (B192). • Buffer zones will be adopted for Project activities (with the exception of required creek crossings), in different areas of constraint, as defined by the project's constraints mapping (outlined in Section 7 and detailed in Constraints Mapping (Appendix BB of the EIS) (B196). • Tracks will be restricted in riparian zones and durations of impacts minimised, except in the immediate vicinity of creek crossings (B199). • During the design and construction of waterway crossings, care will be taken to minimise the footprint of the structure and to avoid unnecessary disturbance to stream beds and banks (B201). • Where practical the width of the easement will also be narrowed at these points, further reducing impacts on stream banks, beds and riparian zones by restricting the area of waterway that would be disturbed (B204).		

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• Gathering line and access road creek crossings will be kept to a minimum where possible (B206). • Watercourse crossings will be minimised, where practicable, during route selection. Where required, crossing locations will be selected to avoid or minimise disturbance to aquatic flora, waterholes, watercourse junctions and watercourses with steep banks (B220). • Watercourse crossings will be designed to enable passage of flows resulting from a 1 in 100 year average recurrence interval flood event, as a minimum (B226). • Gathering lines and tracks will be designed to avoid watercourses, drainage lines and riparian areas (particularly permanent watercourses or perennial aquatic habitat), where practicable (B227). • Pipeline RoWs widths will be designed to be narrower at watercourse crossings, where practicable (B228).		
Construction activities as per plan (no-go areas)	• Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049). • Disturbance exclusion zones (or management buffers) will be established and managed during construction and operations to effectively protect ESAs as defined by the project's constraints mapping (B145). • Trees will be felled away from existing vegetation not identified for removal where practicable (B150). • Damage to trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151). • Avoidance boundaries will be clearly delineated prior to clearing (B166). • Audits/checks will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167). • Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182). • Construction that will potentially affect waterways will occur during dry months (periods of low rainfall and low flow) where possible. The use of machinery and vehicles on stream beds and banks will be avoided wherever possible (B202). • Buffer zones and the Project footprint will be regularly monitored using satellite imagery (B215). • Watercourse crossings will be constructed in a manner that minimises sediment release to watercourses, stream bed scouring, obstruction of water flows and disturbance of stream banks and riparian vegetation (i.e., the crossing location will be at a point of low velocity, and straight sections will be targeted, with the pipeline or road orientated as near to perpendicular to water flow as practicable) (B221).	• To ensure that no unplanned impacts occur on MNES as a result of construction activities	• BGP Construction Manager (Arrow)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• Transport of equipment across watercourses will be avoided unless an appropriate crossing that minimises disturbance to the watercourse bed and banks and to riparian vegetation is available (B225). • Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230).		
Protection of topsoils	• Soil will be stripped according to designated profile depths, subject to further field investigations during stripping (B051). • Where practicable, stripped material will be placed directly onto area to be rehabilitated and spread immediately (if rehabilitation sequences and weather conditions permit) to avoid the requirement for stockpiling (B052). • Soils will be separated into windrows for later collection or re-spreading to minimise compression effects of heavy equipment (B053). • Soil transported by dump trucks may be placed directly into storage. Soil transported by scrapers will be pushed to form stockpiles by other equipment (e.g. dozer) to avoid tracking over previously laid soil to minimise compaction (B054). • Surface of soil stockpiles will be left in as coarsely structured a condition as possible to promote infiltration and minimise erosion until vegetation is established or suitable erosion controls have been applied, and to prevent anaerobic zones from forming (B055). • Pipeline construction will be conducted in a manner that limits the duration of exposure of soils. Stripped and salvaged soil will be re-used within a short period of time (i.e. 28 days) in areas where rehabilitation immediately follows the installation of pipelines (B063). • Erosion and Sediment Control Plans will be developed and maintained in accordance with the International Erosion Control Association (IECA) (2008) Best Practice Erosion and Sediment Control guidelines. All proposed erosion and sediment control measures will be implemented in advance of, or in conjunction with clearing activities (B066). • Topsoil will be stripped, salvaged and stockpiled separately from subsoils (B068). • Appropriate sediment and erosion control structures will be installed and maintained at work sites (B160).	• To ensure that natural vegetation including EPBC Act listed plants and TECs will be able to re-establish.	• BGP Construction Managers (Arrow and Third Party Contractor)
Fauna spotter catcher	• Suitably qualified fauna spotter-catcher (FSC) or ecologist will capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153). The FSC will be at the site on the day of clearing. The FSC will be suitably qualified as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time (new commitment).	• To ensure that no unplanned impacts occur on the Ornamental Snake, Squatter Pigeon, Red Goshawk,	• BGP Construction Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• Trees will be assessed for potential nesting hollows prior to felling. If hollows are identified, trees will be felled in the presence of a qualified FSC and rolled so that the hollows are facing upwards, allowing fauna to escape (B189). • Key Koala trees will be identified and visually inspect prior to clearing to ensure that they are free of Koalas. If Koalas are located, the tree will be retained until the animals have moved on, typically overnight (B190). • Checks for identified EPBC Act fauna species breeding places will be undertaken immediately prior to commencing vegetation clearing (SMP). • Potential breeding places will be clearly marked in the field with spray paint, coloured flagging tape (unless not permitted by land owners, e.g. some cattle properties), or by other suitable methods (SMP).	Koala, South-eastern Long-eared Bat, Large-eared Pied Bat, Greater Glider, or Painted Honeyeater	
Ornamental Snake management	• Where practicable, disturbance will be avoided in areas known or assessed to be suitable habitat for Ornamental Snake during the breeding season (September to April) (SMP). The management hierarchy described in Section 2 will be applied in these situations. • If Ornamental Snake breeding activity is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated (SMP). • Soil cracks within potential Ornamental Snake habitat that could harbour snakes will be marked with spray paint. A borescope, or similar equipment, will be used to determine the presence of a snake. If a snake is found, the spotter-catcher will attempt to dig up the soil crack and remove the animal (SMP). • Spotlighting will be completed in line with Arrow's Ornamental Snake Guideline (ORG-ARW-HSM-GUI-00101, Section 8) when the following are met: – Prior to commencing construction activities that involve significant ground disturbance, and – Within the breeding and high activity period of September to April (SMP). • Ornamental Snakes captured will be retained by a licensed FSC for the duration of the day's construction activities and released in a suitable habitat in close proximity to the site boundaries that evening (i.e. within 24 hours), or retained and released in line with the FSC's permits if construction is ongoing (SMP).	• To minimise impacts and risk of impacts on Ornamental Snake as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)
Squatter Pigeon specific management	• If Squatter Pigeon breeding activity is observed, an exclusion zone (50 m radius) will be enforced until the breeding place is vacated (SMP). • Removal or relocation of individual Squatter Pigeon's, young or eggs will only be undertaken after measures have been taken to avoid and minimise impacts on the identified active breeding place as per the management hierarchy described in Section 2. (SMP).	• To minimise impacts and risk of impacts on Squatter Pigeon as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• As a last resort, Squatter Pigeon eggs or young would be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release (SMP).		
Red Goshawk specific management	• The probability of Red Goshawk nesting in the BGP is considered low. However, should a potential nest be identified in proximity to existing or proposed project activities Arrow (with Construction Contractor) would: – Stop work at the location. – Notify Arrow so that Arrow may notify the relevant authorities (i.e. DotEE and DES). – Seek approval from DotEE for additional disturbance if any impact is 'significant' and unavoidable. – Manage the species or community in accordance with the mitigation measures listed in Appendix C and all applicable conditions of approval including the Offset Strategy for the relevant Project phase. – Tag/barricade the identified species/community in an appropriate manner to ensure protection. – Cease clearing works in the immediate area. – Record GPS coordinates so that it may be incorporated into the Site Environmental Map as a 'no-go zone' or recorded as an impact area. – Provide all relevant information to Arrow for monthly tracking of EPBC Act species and community impacts for annual reporting (SMP).	• To minimise impacts and risk of impacts on Red Goshawk as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)
Koala specific management	• If a Koala is found within the clearing footprint; a minimum exclusion zone of 100 m will be established for a female Koala with obvious young and 50 m for all other Koala, until the animal has moved of its own accord. No vehicles are to enter the buffer (exclusion) zone at any time. Vehicle operators will be made aware of the presence of the Koala and a reduced speed limit established until the animal has moved on of its own accord (SMP).	• To minimise impacts and risk of impacts on Koala as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)
South-eastern Long-eared Bat specific management	• All reasonable and practicable attempts (if safe to do so) will be made to check hollow bearing trees, hollow logs, peeling bark and splits in tree trunks for the presence of South-eastern Long-eared Bat (SMP). • If breeding activity of South-eastern Long-eared Bat is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated. • As a last resort, South-eastern Long-eared Bat young would be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release. • Where hollows containing South-eastern Long-eared Bat maternity sites have been identified that are inactive and unavoidable, the FSC is to determine whether it is to be relocated or left in situ.	• To minimise impacts and risk of impacts on South-eastern Long-eared Bat as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• Where relocation of South-eastern Long-eared Bat in tree hollows is required, an elevated work platform or cherry-picker may be used in conjunction with a chainsaw operator and the FSC (or a FSC who holds a current training qualification in use of chainsaws) to attempt to remove the hollow. The following step-by-step process (modified from Nottidge, 2012) will be considered if safe to do so: – The FSC (with chainsaw operator unless the FSC is a qualified chainsaw operator) will inspect each visible hollow or potential breeding place (e.g. nest) identified in each tree using the cherry picker. This is usually carried out by simply looking into hollows and nests (with the assistance of a small torch); however, fibrescopes may also be useful for deep hollows. – If bats are located within a hollow, a piece of towel or rag would be firmly placed in the entrance to prevent the wildlife from escaping, as they may attempt to flee the nesting/denning hollow. – Once the hollow entrance has been secured, the chainsaw operator will remove the entire hollow limb below the cavity where the branch remains solid. In circumstances where a hollow continues into the main stem of the tree, the chainsaw operator would carefully cut a small window into the hollow, allowing the FSC to plug the hollow above and below the window, then the hollow limb is removed and lowered to the ground in sections. – When the bats have been safely secured within its hollow, the entire limb would then be placed in the cherry-picker bucket or lowered to the ground using ropes (depending on the size of the limb). – This limb would be placed in a cool, quiet location until translocation to the recipient habitat site, when at dusk of the same day the hollow entrance will be reopened to allow the bats to emerge of their own accord. • All reasonable and practicable attempts (if safe to do so) will be made to check suitable caves for the presence of Large-eared Pied Bat.		

In addition to the mitigation measures listed in Table 3.1, Arrow's response to, and reporting of, injury or mortality of EPBC Act fauna is described in Sections 3.1 and 3.2.

3.1 Arrow response to fauna mortality and injury

In the case of animal mortality/injury, the suitably qualified ecologist/spotter/catcher would inspect the animal to determine the extent of injury and the following would occur:

- If injured, temporary first-aid shall be applied (e.g. stopping blood-flow or binding a wound or broken limb). For superficial scratch wounds, antibiotic ointment, spray or powder shall be applied prior to release.
- Sickness usually takes the form of cold stress during winter (this is alleviated during trapping by providing insulated material within any traps). An animal which appears to be suffering from cold-stress will be placed in a warm holding container in a quiet area until it recovers. Holding containers are always carried as part of the survey equipment and comprise tins or appropriate wooden or plastic boxes/ carriers.
- If successful recovery does not appear to be occurring, or the injury requires further treatment, the animal will be transported in a holding container to the nearest veterinarian or to a local wildlife carer.
- Fauna will not be contained for longer than four hours. If prolonged containment is necessary due to difficultly accessing storage facilities (i.e. veterinary surgery, wildlife carers premises), food and water shall be provided.
- The final aim of the response is to release the recovered animal back into the area where it was originally captured. Once assessed by a veterinary surgeon, injured or sick fauna shall be transported to an authorised wildlife carer if it is to be rehabilitated. If the fauna is to be released into the wild, the animal will be released in the location where it was originally captured.
- If it is necessary to euthanize an animal, humane procedures will be used. These procedures will be reliable, avoid distress and produce rapid loss of consciousness without pain until death occurs. It is important to recognise that whilst some physical methods of euthanasia (e.g. stunning followed by exsanguinations) are not aesthetically pleasant, they may be humane as they ensure immediate insensitivity to pain. The choice of technique will be made based on the sensibilities of the animal to be euthanized rather than the sensitivities of the observer or personnel involved.
- Spotter/catchers used by Arrow receive instruction of humane methods of euthanasia prior to entering the field. Should a situation arise where the spotter/catcher is not suitable or comfortable then works will stop and not proceed until assistance from another suitably qualified spotter/catcher can attend the site and deal with the situation. During this time no further works are permitted to occur.

- Animals that are euthanized or found dead will be disposed of humanely and at or near the site where they were found.

3.2 Reporting on fauna mortality and injury

Regular reporting for the BGP will be included in the annual report provided to the Department.

With regards to exceptional events, such as mortality to an EPBC listed species as a result of the BGP activities, the following information is collected:

- During vegetation clearing, information on all fauna impacted by the clearing works (i.e. instances that have involved the spotter/catcher) are recorded.
- Photographs of the fauna and habitat features will be communicated through various methods (e.g. posters, presentations, etc.) to assist site staff with the identification of fauna and their required habitats.
- Data/information must be provided to the Arrow permit holder or authorised representative and include the following:
  - Fauna sighted, relocated, injured and/or euthanized
  - Fauna breeding places identified and actions taken
  - Notable actions
  - GPS co-ordinates for any species that was captured, relocated or euthanized. The co-ordinate should be of the capture point and the release point, where relevant.

With regards to exceptional events, such as mortality to an EPBC listed species as a result of BGP activities, the following reporting to the Department will occur:

- Reporting of such an exceptional event will be carried out in writing to the Secretary of DotEE within a short period (e.g. 7 days) of Arrow becoming aware of the incident (contact details used will be as per the Department's webpage: http://www.environment.gov.au/biodiversity/threatened/listed-species-and-ecological-communities-notification).
- All such incidents will be reported on an Arrow incident report form and registered in an electronic database.
- The information provided to the Secretary will include the listed threatened species, the date on which the incident took place, the activity being undertaken at the time of the incident, and the immediate actions taken as a result of the death.

- Incidents will be assessed and tracked to ensure that the appropriate investigation, corrective actions and measures are taken to prevent the incident from reoccurring.
- Incidents will be reviewed by Arrow on a monthly and annual basis to determine incident trends, which will enable targeting of areas that require further adaptive management to assist in preventing future incidents. While the review of incidents will occur monthly, the reporting of such trends will be annual.
- The annual reporting required by Condition 30 will also include information pertaining to mortalities of any listed threatened species.

4. Mitigation measures during construction, operation and decommissioning

Condition9(b): Measures that will be taken to avoid, mitigate and manage impacts to EPBC listed threatened species and their habitat and to EPBC communities during construction, operation and decommissioning of the action.

Table 3.1 in the preceding section described the mitigation measures relevant to the construction phase and particularly in relation to clearing activities. This section does not repeat those measures but rather describes measures additional to those provided in Table 3.1.

Many of the mitigation measures that will be undertaken to avoid or reduce impacts to EPBC species and communities during construction, operation and decommissioning are consistent with relevant BGP EIS mitigation commitments (see Appendix O of the Supplementary EIS for the full list of Arrow's mitigation commitments for the BGP). These are included in Table 4.1 (with the BGP EIS commitment number provided in parenthesis).

Further to the commitments provided within the BGP EIS and reproduced below, a number of other mitigation measures included within the Arrow Energy Species Management Program for Tampering with Animal Breeding Places (which was developed for the State Department of Environment and Science (DES) in March 2018) are of relevance and have been included in the list below. These measures are marked 'SMP'.

The particular mitigation measures that relate to each individual EPBC Act species and community are identified in the individual species and community profiles provided as Appendix C. Measures that are proposed by Arrow to address Condition 9(b) beyond those listed in Table 3.1 are listed in Table 4.1. In addition to the mitigation measures listed in Table 4.1, Arrow's response to, and reporting of, injury or mortality of EPBC Act fauna during construction, operation and decommissioning is as described previously in Sections 3.1 and 3.2.

Table 4.1 Description of additional mitigation measures / commitments

Mitigation	Commitment	Intended outcome	Responsible manager/s
Construction - clearing	• See Table 3.1		
Construction - Open trench management	• Trenches will be inspected and monitored as per the APIA Code of Environmental Practice (B159) and will be checked within two hours of sunrise and trapped fauna released. Additional monitoring will be undertaken following rainfall events (SMP). • The time a trench is left open will be minimised. Fauna exit points will be incorporated when construction is within 1 km of native vegetation, using appropriate material. Fauna refuges, such as sawdust-filled bags, will be provided regularly through areas of high fauna activity (B173). • As soon as practical following pipe laying, the trench will be backfilled with excavated material, compacted and topsoil replaced and erosion controls implemented (B299).	• To ensure that no unplanned impacts occur on Ornamental Snake, Koala or Greater Glider	• BGP Construction Managers (Arrow and Third Party Contractor)
Construction - Reduce light spill	• Lighting will be designed in a manner that limits disruption on landscape character, views and visual amenity and lighting will be directed into the infrastructure siting rather than dispersed into native vegetation when sites are adjacent to intact habitat (B099).	• To ensure that no unplanned impacts occur on the Red Goshawk, Koala, South-eastern Long-eared Bat, Large-eared Pied Bat and Greater Glider	• BGP Construction Managers (Arrow and Third Party Contractor)
Construction - Reduce project traffic speed	• Speed limits on Project controlled roads will be developed with due consideration to reduce the potential for vehicle collisions with wildlife (B154).	• To ensure that no unplanned impacts occur on Ornamental Snake, Squatter Pigeon or Koala	• BGP Construction Managers (Arrow and Third Party Contractor)
Construction - Bushfire	• Fire management plans will be developed for production facilities (B471). • Radiation exclusion zones around flares will be designed according to API standard (B485). • Enclosed spaces where flammable gas may accumulate will be minimised (B487). • Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499). • Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with	• To avoid degradation of TECs • To avoid reduction in the condition of listed threatened species habitat	• BGP Construction Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	consideration of the site-specific risk of bushfire (B503). • Fire-safety equipment will be commissioned in the early phase of the construction period (B505). • All buildings and production facilities will be fitted with smoke or fire alarms (B506). • Fire and gas detection systems will be installed to shutdown compressors (B508). • Protocols will be developed for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns (B533). • Regular patrols and inspections of pipeline easements will be conducted, including status of signposting subsidence and of fire breaks (B536). • Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544). • Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547). • Daily operations will be managed with consideration of the fire danger current at that time (B548).		
Construction / Operation / Decommissioning - Weed control	• A detailed pest management plan will be developed to mitigate and manage the potential spread of pest flora and fauna species (B152). This plan will include requirements for machinery washdown procedures to be followed during all clearing activities (new commitment). • Weed monitoring and targeted weed control measures will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158). Weed control methods within EVNT habitats will be selected on the basis of minimising the risk of adverse impacts on EVNT species or communities (new commitment). • In accordance with the Pest Management Plan regular inspections for pest flora and evidence of pest fauna will be undertaken within Project disturbed areas (B171). • Washdown facilities will be designed to ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to adjacent areas (B172).	• To avoid degradation of TECs • To avoid reduction in the condition of listed threatened species habitat • Successful implementation of Arrow's Vehicle and Machinery Hygiene Procedure (ORG-ARW-HSM-PRO-00138) and Weed Management Procedure (ORG-ARW-HSM-PRO-00139)	• BGP Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• When sourcing maintenance materials, materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180). • All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188). • A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through Project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191).		
Construction / Operation / Decommissioning – Pest control	• Arrow will manage food, waste and other project activities to prevent or minimise the potential for these to transport or attract pest animals which may then impact MNES (new commitment).	• Successful implementation of Arrow's Pest Management Procedure (ORG-ARW-HSM-PRO-00096)	• BGP Managers (Arrow and Third Party Contractor)
Operation - Grazing	• Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites.	• To avoid degradation of TECs • To avoid reduction in the condition of listed threatened species habitat	• BGP Operations Managers (Arrow)
Operation / decommissioning - Appropriate rehabilitation	• The cleared areas and stockpiles will be progressively rehabilitated through revegetation and/or mulching (B021). • Areas will be cleared progressively and rehabilitation implemented as soon as practicable following construction and decommissioning activities (B033). • Rehabilitation timeframes will be compliant with applicable Environmental Authority conditions and consider any landholder requirements/expectations (new commitment) • Rehabilitation plans will be developed addressing ground preparation requirements, natural and constructed drainage patterns, soil erodibility, contamination, slope	• To ensure that no unplanned impacts occur on MNES as a result of construction activities • To return the area to pre-disturbed condition (or better) as agreed with the landholder and as required	• BGP Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	steepness and length, vegetation cover, land use and landowner requirements (B064). Partial rehabilitation of gathering lines and other linear infrastructure will be undertaken to reduce edge effects (including weed invasion) and maintain movement rates (B156). • Rehabilitation of available areas will be undertaken that is consistent with pre-clearance habitats, to increase the rate of recovery (B157). • Woody debris, logs and rocks will be retained for use in rehabilitation. Where practical, these will be piled along the edge of the cleared corridor. Where possible these features will be spread over all or part of the corridor to provide refugia for crossing fauna. Systematic removal of surface debris will be avoided and cleared timber will never be burnt (B161). • Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163). • Site planning, preparation and management requirements will be implemented in accordance with a decommissioning and rehabilitation plan (B175). • After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177). • Regular monitoring of rehabilitation success will be carried out (B183). • During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186). • Excavations, particularly pipeline trenches and drilling sumps, will be backfilled and rehabilitated. Backfilling will be conducted in a manner that will promote successful rehabilitation, including capping of exposed subsoil with topsoil and replacement of the land surface to preconstruction levels to reduce trench subsidence and concentration of flow. Soils will be mounded where required to allow for settling. However, in laser-levelled paddocks, this may not be practicable, and backfilling will be carried out in consultation with the landowner (B233). • A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339).	by DES in order to grant progressive rehabilitation certification and EA surrender	

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591). • A final rehabilitation report and a decommissioning plan, including a contaminated land assessment where required, landowner commitments and agreements, and rehabilitation status, will be prepared and submitted to the appropriate authorities for approval where required (B592). • The area disturbed within the pipeline corridor during the laying of the pipelines will be progressively rehabilitated as soon as practicable after completion of the pipeline installation. Fences, roads and tracks and other existing infrastructure impacted during construction of the pipeline will be repaired and/or replaced as required (B594). • At decommissioning, a suitable vegetation cover will be re-established to enable natural vegetation progression and minimal weed invasion (B606). • Final ground conditions will be rehabilitated to a state that is conducive to support further natural regeneration at project closure (B607).		
Construction / Operation / Decommissioning - Documentation	• A Water Management Plan, Erosion and Sediment Control Plan, and Waste Management Plan will be designed to avoid or minimise the potential impacts of Project (B207). • Corrective actions will be undertaken in accordance with the outcomes of incident investigations, audits, monitoring results or advice given by the relevant regulatory authority (B593). • Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480).	• To ensure that the planned (and actual) impacts to MNES are accurately documented and offset	• Environment Manager (Arrow)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	• Any residual impacts to EPBC Act species and communities will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impact (new commitment).		
Construction / Operation / Decommissioning - Hazardous materials management	• Appropriate international, Australian and industry standards and codes of practice will be applied for the handling and storage of hazardous materials, such as chemicals, fuels and lubricants (B078). • Appropriate spill response equipment including containment and recovery equipment will be available onsite (B079). • Staff will be trained on appropriate handling, storage and containment practices for chemical, fuels and other potential chemicals as relevant (B083).	• To avoid degradation of TECs • To avoid reduction in the condition of listed threatened species habitat	• BGP Managers (Arrow and Third Party Contractor)
Ornamental Snake management	• Where practicable, disturbance will be avoided in areas known or assessed to be suitable habitat for Ornamental Snake during the breeding season (September to April) (SMP). • If Ornamental Snake breeding activity is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated (SMP). • Soil cracks within potential Ornamental Snake habitat that could harbour snakes will be marked with spray paint. A borescope, or similar equipment, will be used to determine the presence of a snake. If a snake is found, the spotter-catcher will attempt to dig up the soil crack and remove the animal (SMP). • Spotlighting will be completed in line with Arrow's Ornamental Snake Guideline (ORG-ARW-HSM-GUI-00101, Section 8) when the following are met: – Prior to commencing construction activities that involve significant ground disturbance, and – Within the breeding and high activity period of September to April (SMP). • Ornamental Snakes captured will be retained by a licensed FSC for the duration of the day's construction activities and released in a suitable habitat in close proximity to the site boundaries that evening (i.e. within 24 hours), or retained and released in line with the FSC's permits if construction is ongoing (SMP).	• To minimise impacts and risk of impacts on Ornamental Snake as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
Squatter Pigeon specific management	• If Squatter Pigeon breeding activity is observed, an exclusion zone (50 m radius) will be enforced until the breeding place is vacated (SMP). • Removal or relocation of individual Squatter Pigeon's, young or eggs will only be undertaken after measures have been taken to avoid and minimise impacts on the identified active breeding place as per the management hierarchy described in Section 2. (SMP). • As a last resort, Squatter Pigeon eggs or young may be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release (SMP).	• To minimise impacts and risk of impacts on Squatter Pigeon as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)
Red Goshawk specific management	• The probability of Red Goshawk nesting in the BGP is considered low. However, should a potential nest be identified in proximity to existing or proposed project activities Arrow (with Construction Contractor) would: – Stop work at the location. – Notify Arrow so that Arrow may notify the relevant authorities (i.e. DotEE and DES). – Seek approval from DotEE for additional disturbance if any impact is 'significant' and unavoidable. – Manage the species or community in accordance with the mitigation measures listed in Appendix C and all applicable conditions of approval including the Offset Strategy for the relevant Project phase. – Tag/barricade the identified species/community in an appropriate manner to ensure protection. – Cease clearing works in the immediate area. – Record GPS coordinates so that it may be incorporated into the Site Environmental Map as a 'no-go zone' or recorded as an impact area. – Provide all relevant information to Arrow for monthly tracking of EPBC Act species and community impacts for annual reporting (SMP).	• To minimise impacts and risk of impacts on Red Goshawk as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
Koala specific management	• If a Koala is found within the clearing footprint; a minimum exclusion zone of 100 m will be established for a female Koala with obvious young and 50 m for all other Koala, until the animal has moved of its own accord. No vehicles are to enter the buffer (exclusion) zone at any time. Vehicle operators will be made aware of the presence of the Koala and a reduced speed limit established until the animal has moved on of its own accord (SMP).	• To minimise impacts and risk of impacts on Koala as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)
South-eastern Long-eared Bat specific management	• All reasonable and practicable attempts (if safe to do so) will be made to check hollow bearing trees, hollow logs, peeling bark and splits in tree trunks for the presence of South-eastern Long-eared Bat (SMP). • If breeding activity of South-eastern Long-eared Bat is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated (SMP). • As a last resort, South-eastern Long-eared Bat young may be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release (SMP). • Where hollows containing South-eastern Long-eared Bat maternity sites have been identified that are inactive and unavoidable, the FSC will determine whether it is to be relocated or left in situ (SMP). • Where relocation of South-eastern Long-eared Bat in tree hollows is required, an elevated work platform or cherry-picker may be used in conjunction with a chainsaw operator and the FSC (or a FSC who holds a current training qualification in use of chainsaws) to attempt to remove the hollow. The following step-by-step process (modified from Nottidge, 2012) will be considered if safe to do so: – The FSC (with chainsaw operator unless the FSC is a qualified chainsaw operator) will inspect each visible hollow or potential breeding place (e.g. nest) identified in each tree using the cherry picker. This is usually carried out by simply looking into hollows and nests (with the assistance of a small torch); however, fibrescopes may also be useful for deep hollows. – If bats are located within a hollow, a piece of towel or rag would be firmly placed in the entrance to prevent the wildlife from escaping, as they may attempt to flee the nesting/denning hollow. – Once the hollow entrance has been secured, the chainsaw operator will remove the entire hollow limb below the cavity where the branch remains	• To minimise impacts and risk of impacts on South-eastern Long-eared Bat as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)

Mitigation	Commitment	Intended outcome	Responsible manager/s
	solid. In circumstances where a hollow continues into the main stem of the tree, the chainsaw operator would carefully cut a small window into the hollow, allowing the FSC to plug the hollow above and below the window, then the hollow limb is removed and lowered to the ground in sections. – When the bats have been safely secured within its hollow, the entire limb would then be placed in the cherry-picker bucket or lowered to the ground using ropes (depending on the size of the limb). – This limb would be placed in a cool, quiet location until translocation to the recipient habitat site, when at dusk of the same day the hollow entrance will be reopened to allow the bats to emerge of their own accord.		
Large-eared Pied Bat specific management	• All reasonable and practicable attempts (if safe to do so) will be made to check suitable caves for the presence of Large-eared Pied Bat (new commitment).	• To minimise impacts and risk of impacts on Large-eared Pied Bat as a result of construction activities	• BGP Construction Managers (Arrow and Third Party Contractor)

5. Monitoring program

Condition 9(c): A monitoring program to determine the success of mitigation and management measures to ensure adaptive management for the duration of this approval.

Monitoring will be undertaken to determine the success of the mitigation and management measures identified within this SIMP and to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. The monitoring program will focus on those sensitive ecological values at risk of a high to extremely high level of residual impact and will be based on review and assurance of the environmental management plan active for the site. The active plan will include reference to the relevant environmental impact management processes and procedures, assurance methods and incident response procedures.

Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance. Corrective actions will be undertaken based on the outcomes of incident investigations, audits, monitoring results and advice given by the relevant regulatory authority.

Table 5.1 sets out the monitoring program which will be undertaken which relate specifically to EPBC Act species and communities. The table describes the location, methods and proposed timing as well as identifying responsible parties, reporting formats, trigger values for corrective actions to be initiated and describes adaptive management responses and / or how they will be determined. Where relevant, existing BGP EIS commitments are identified by commitment numbers in parenthesis. The particular monitoring activities that relate to each individual EPBC Act species and community are identified in Appendix C.

Note that Geocortex and the Arrow Sharepoint database, referred to in Table 5.1 is a web-based collaborative platform that integrates with Microsoft Office and allows multiple users to enter and view project data.

Table 5.2 identifies the indicators of success and corrective actions that correlate to each of the mitigation measures identified in Tables 3.1 and 4.1.

Table 5.1 Monitoring program components for EPBC Act species and communities

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
Review of compliance with approval conditions and SIMP mitigation measure commitments	The coordinates and total area of cleared EPBC Act species and community habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting. All confirmed cases of non-compliance (and remedial actions) will be reported on the Arrow website. Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640).	BGP activity areas	Annual	Arrow	Annual Compliance Report	Non - compliances	As determined by Annual Compliance Reports
Pre- clearance surveys	Surveys to identify any additional areas that need to be avoided (B132) and quantify areas of EPBC Act species, species habitat or TEC which are unavoidable and will be cleared. As a minimum, these will include: • vegetation mapping at a scale suitable for site-specific planning. • identification of core habitats for EVNT species.	Proposed vegetation clearing sites	Prior to all vegetation clearing Reported annually	Supervised by a suitably qualified person	Annual Pre - clearance Survey Report provided on the Arrow website	Clearances proposed which would result in the project exceeding the maximum disturbance limit for any EPBC Act species or communities	A more detailed assessment will be undertaken to identify if the EPBC Act species, habitat or community can be avoided or impacts minimised. Information on the findings and potential impacts will be prepared and notification provided to DotEE and Department

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
	• identification of site-specific sensitive areas (e.g. ESAs) that require avoidance or buffers (B132). Quantification will be based on field recording of GPS coordinates of the boundary of the core habitat within proposed clearing boundaries. These surveys will also be used to ensure that the limits of the area to be cleared are clearly marked on the ground (i.e. high visibility flagging tape, hazard netting or similar) in accordance with the construction limits shown on construction drawings.					including any residual significant impact to any of these that are not included in Table 1 of the EPBC approval.	of Environment and Science (DES). Approval for additional unavoidable residual significant impacts to any EPBC Act species or community (including any of these which were not in Table 1 of the EPBC approval) will be sought. Arrow also commits to providing offsets for any such additional residual significant impacts. See Section 6 for further details on Arrow's process for addressing impacts to EPBC species or communities not identified in Table 1 of the EPBC approval.
	Key Koala trees will be identified and visually inspected prior to clearing to ensure that they are free of Koalas (B190).	Proposed vegetation clearing sites	Prior to vegetation clearing and daily during clearing works	Supervised by a suitably qualified person	Koala presence recorded within Geocortex and the Arrow Sharepoint database. Spotter-catcher daily activity records	Koalas located	Trees containing Koalas retained until the animals have moved on (B190).

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
	Hollow-bearing tree locations and patches of vegetation with a distinct canopy and a dense cluttered shrub layer will be recorded.	Proposed vegetation clearing areas within core habitat for the South-eastern Long-eared Bat	Prior to vegetation clearing	Supervised by a suitably qualified person	Hollow-bearing trees and preferred habitat patches recorded within Geocortex and the Arrow Sharepoint database	Hollow-bearing tree and preferred habitat patches identified	Spotter-catcher present and search for this species in these areas during clearing.
	Record Painted Honeyeater individuals and dense stands of mistletoe.	Proposed vegetation clearing areas within core habitat for the Painted Honeyeater	Prior to vegetation clearing	Supervised by a suitably qualified person	Individuals and preferred habitat patches recorded within Geocortex and the Arrow Sharepoint database	Individuals or preferred habitat patches identified	Spotter-catcher present and search for this species during clearing.
	Trees will be assessed for potential nesting hollows prior to felling (B189).	Proposed vegetation clearing sites	Prior to clearing	Supervised by a suitably qualified person	Nesting hollows recorded within Geocortex and the Arrow Sharepoint database. Spotter-catcher daily activity records.	Nesting hollows identified	Trees will be felled in the presence of a FSC and rolled so that the hollows are facing upwards, allowing fauna to escape (B189).
	Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other BGP related activities, will be ongoing until rehabilitation is complete (B163). Pre-clearance surveys will include searches for EVNT species and communities.	Predicted and known EVNT species locations	During pre-clearance surveys and checking of open trenches	Arrow	Recorded within Geocortex and the Arrow Sharepoint database	Clearances proposed which would result in the BGP exceeding the maximum disturbance limit for any	A more detailed assessment will be undertaken to identify if the EPBC Act species, habitat or community can be avoided or impacts minimised before the clearing takes place. Information on the

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
						EPBC Act species or communities including any residual significant impact to any of these which are not included in Table 1 of the EPBC approval.	findings and potential impacts will be prepared and notification provided to DotEE and DES. Approval for additional unavoidable residual significant impacts to any EPBC Act species or community (including any of these which were not in Table 1 of the EPBC approval) will be sought. Arrow also commits to providing offsets for any such additional residual significant impacts. See Section 6 for further details on Arrow's process for addressing impacts to EPBC species or communities not identified in Table 1 of the EPBC approval.
Monitoring for unauthorised clearing	Audits/checks will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167). Buffer zones and the Project footprint will be regularly monitored using satellite imagery (B215).	Vegetation clearing areas	At least daily during clearing and at the completion of clearing	Construction contractor (environmental representative)	The Construction Contractor is required to report any unauthorised clearing to the Arrow Environment Manager within 24hrs of becoming aware.	Unauthorised Clearing	Review of CEMP with Construction Contractor and amendment as required.

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
Fauna spotter-catcher monitoring	A FSC will be at the site on the day of clearing. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time.	Active vegetation clearing areas	At all times during clearing	Suitably qualified FSCs as per the definition provided in EPBC 2012/6377	All human/wildlife interactions or incidents involving EVNT Act fauna species will be reported to Arrow via the Fauna Incident Notification Form (FIN) within 24 hours, and will be detailed in the FSC report to be provided to Arrow at the completion of habitat clearing activities (or weekly if clearing activities are ongoing). The FSC report will also detail all human/wildlife interactions or incidents with any species irrespective of their conservation status. Interactions are defined as observations of the species on the work site, captures, removals and	Injury to or mortality of individuals of EPBC Act species.	An investigation into possible root causes would be undertaken as well as a review of relevant mitigation measures and the CEMP and refinement of these where necessary.

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
					relocations. Incidents are defined as any injury or death.		
Inspection for fauna entrapment	Trenches will be inspected and monitored as per the APIA Code of Environmental Practice (B159) and will be checked within two hours of sunrise and trapped fauna released. Additional inspections will be undertaken after rainfall events.	All open trenches	At least daily whenever trenches are open	Suitably qualified person	Fauna rescue records	Injury to or mortality of individuals of EPBC Act species	Construction of additional fauna exit ramps / ladders; installation of additional trench plugs; increased frequency of inspections.
EPBC fauna presence and frequency monitoring	Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163). Consideration will be given to conducting targeted monitoring in co-operation with the proponents of overlapping Projects. Particularly suited species to such monitoring include Ornamental Snake and Koala (B165).	Representative habitat areas in proximity to project disturbed areas or infrastructure	Annual	Supervised by a suitably qualified person	Annual EPBC Monitoring Report	Statistically significant reduction in EPBC fauna frequency attributable to the BGP	An investigation into possible root causes would be undertaken as well as a review of relevant mitigation measures and the CEMP and refinement of these where necessary.
Analysis of EPBC Act fauna species mortality records	EVNT fauna mortality (e.g. road kill) record database will be maintained and analysed.	All BGP areas	Incident based throughout the life of the project	Arrow	Recorded within Geocortex and the Arrow Sharepoint database and reported in Annual Compliance Report	Any EVNT fauna mortalities caused by BGP activities	Dependence on the cause of mortality responses could include installation of warning signs or fencing and reduction in speed limits in specific locations.

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
King Bluegrass presence and frequency and habitat condition monitoring	Inspections for King Bluegrass presence and frequency and habitat condition will be undertaken in accordance with the Queensland Government Department of Environment and Heritage Protection's Guide to determining terrestrial habitat quality – A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy (2017).	Representative areas of known occupancy in proximity to project disturbed areas or infrastructure	Annual	Supervised by a suitably qualified person	Annual EPBC Monitoring Report	Statistically significant reduction in frequency or a whole number fall in average habitat quality score	An investigation into possible root causes would be undertaken within 3 months of a corrective action trigger as well as a review of relevant mitigation measures and the CEMP and refinement of these where necessary.
EPBC Act community condition monitoring	Inspections for EPBC community health will be undertaken in accordance with the Queensland Government Department of Environment and Heritage Protection's Guide to determining terrestrial habitat quality – A toolkit for assessing land based offsets under the Queensland Environmental Offsets Policy (2017).	Representative TEC areas in proximity to project disturbed areas or infrastructure	Annual	Supervised by a suitably qualified person	Annual EPBC Monitoring Report	A whole number fall in average habitat quality score for a TEC	An investigation into possible root causes would be undertaken within 3 months of a corrective action trigger as well as a review of mitigation measures and CEMP and refinement where necessary.
Weed and pest monitoring	Weed surveys (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158). In accordance with the Pest Management Plan regular inspections for pest flora and	Representative Project disturbance areas within areas known to contain Black Ironbox, Bluegrass, King Bluegrass,	At least quarterly and reported at least annually	Arrow	Annual EPBC Monitoring Report	New weeds recorded. Higher weed cover within disturbed areas relative to adjoining areas.	Additional weed management measures at problem locations. Review of Weed and Pest Management Plan.

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
	evidence of pest fauna will be undertaken within Project disturbed areas (B171). Weed surveys will include searches for *Prosopis glandulosa* (Mesquite), *Parthenium hysterophorus* (Parthenium Weed), *Eragrostis curvula* (African Lovegrass) and *Lippia alba* (Lippia) presence and cover (B191). Surveys will also search for any new weed and pest species being introduced to an area (new commitment).	Squatter Pigeon, Brigalow TEC, Weeping Myall TEC, Native Grassland TEC and SEVT TEC.					
Rehabilitation monitoring	Pipeline RoWs will be regularly inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095). After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177). Regular checks of rehabilitation success will be carried out (B183). A rehabilitation management plan for decommissioning will be developed and implemented which includes inspections and maintenance of rehabilitated areas	All Project disturbed areas	Post-construction, at least quarterly and reported annually	Supervised by a suitably qualified person	Annual EPBC Monitoring Report	Rehabilitation data trending away from, and prior to, non-achievement of rehabilitation completion criteria	An investigation into possible root causes would be undertaken within 3 months of the corrective action trigger including a review of the suitability of rehabilitation methods being applied.

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
	until rehabilitation sign off criteria are met (B339). Surveys/inspections of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Surveys/inspections will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of surveys/inspection data will be conducted during operations, and post closure, to assess trends and performance.						
Offset area monitoring	As per Condition 13 of the Variations to Conditions Attached to Approval (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked	Offset areas	During the life of each offset area	Arrow	Offset progress reports which will feed into the Offset Strategies for subsequent Project Phases	These will be identified within each strategy / offset area management plan	These will be identified within each strategy / offset area management plan.

Monitoring Activities	Methods / commitments	Locations	Timing	Who	Reporting format	Corrective action trigger values	Adaptive management responses
	for the offset areas.						

Table 5.2 Description of mitigation measures, indicators of success and corrective actions

Mitigation	Commitment	Indicator of success	Corrective action
Pre-construction clearance surveys / minimise clearing	• When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database (new commitment). • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that EPBC species or community habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked (new commitment). • The disturbance footprint and vegetation clearing will be minimised (B017). • The land cleared for construction purposes will be kept to the minimum necessary, especially during the drier months of the year (B018). • Land disturbance will be minimised with the smallest practical area of land being disturbed in the shortest practicable time (B047). • All operations will be planned to ensure minimal damage on any vegetation, cropping or pasture areas outside the limits to be cleared (B050). • Disturbance within the following areas will be avoided where possible (part of B131): – Endangered EPBC Act TECs: Brigalow Ecological Community; Natural Grasslands Ecological Community; Semi-evergreen Vine Thicket Ecological Community; Weeping Myall Woodlands). – Core habitat for EVNT species.	• Preconstruction clearance surveys by a suitably qualified ecologist are conducted at every site of proposed activities in areas mapped as core habitat known and core habitat possible for MNES • There is documented evidence that the management hierarchy described in Section 2 has been implemented at every site of proposed activities in areas mapped as core habitat known and core habitat possible for MNES • Linear infrastructure easements (right-of-way) will be within the limits authorised by the Environmental Authority (EA) • The MNES impact areas are equal to or less than the impact areas shown in Tables 1.2 of this document	• Undertake preconstruction clearance surveys by suitably qualified ecologist • Investigate the cause of non-conformance with the management hierarchy and amend the relevant processes / procedures to avoid future non-conformance • Investigate the cause of non-conformance with EA conditions and amend the relevant processes / procedures to avoid future non-conformance • Notify the Department of the Environment and Energy of impacts beyond those shown in Table 1.2 and make the necessary adjustment in

Mitigation	Commitment	Indicator of success	Corrective action
	• Pre-clearance surveys will be conducted to identify any additional areas that need to be avoided. As a minimum, these will include (B132): – vegetation mapping at a scale suitable for site-specific planning. – identification of core habitats for EVNT species. – identification of site-specific sensitive areas (e.g. ESAs) that require avoidance or buffers. • Wells, gathering lines and access tracks will be located within previous clearings or non-remnant vegetation if possible (B133). • Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134). • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135). • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136). • Habitat trees will be retained where practicable (B137). • Removal of riparian vegetation will be avoided when directional drilling and reduction of right of ways where practical (B138). • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140). • Sensitive infrastructure design principles will be applied to avoid watercourse, drainage lines and riparian areas where practicable (B142). • Pre-clearance surveys will be undertaken to determine the likelihood of the species (including weeds) occurring (B155). • Where EVNT species are identified in proposed development areas, consideration will be given to mitigation measures such as translocation and/or propagation of flora species. Progress of any translocation programs will be monitored in accordance with the relevant translocation management plans (B169). • The width of construction RoWs will be minimised within areas of sensitivity to the		the Offset Strategy / Plan for the subsequent phase

Mitigation	Commitment	Indicator of success	Corrective action
	greatest extent practicable without compromising the safety of workers (B192). • Buffer zones will be adopted for Project activities (with the exception of required creek crossings), in different areas of constraint, as defined by the project's constraints mapping (outlined in Section 7 and detailed in Constraints Mapping (Appendix BB of the EIS) (B196). • Tracks will be restricted in riparian zones and durations of impacts minimised, except in the immediate vicinity of creek crossings (B199). • During the design and construction of waterway crossings, care will be taken to minimise the footprint of the structure and to avoid unnecessary disturbance to stream beds and banks (B201). • Where practical the width of the easement will also be narrowed at these points, further reducing impacts on stream banks, beds and riparian zones by restricting the area of waterway that would be disturbed (B204). • Gathering line and access road creek crossings will be kept to a minimum where possible (B206). • Watercourse crossings will be minimised, where practicable, during route selection. Where required, crossing locations will be selected to avoid or minimise disturbance to aquatic flora, waterholes, watercourse junctions and watercourses with steep banks (B220). • Watercourse crossings will be designed to enable passage of flows resulting from a 1 in 100 year average recurrence interval flood event, as a minimum (B226). • Gathering lines and tracks will be designed to avoid watercourses, drainage lines and riparian areas (particularly permanent watercourses or perennial aquatic habitat), where practicable (B227). • Pipeline RoWs widths will be designed to be narrower at watercourse crossings, where practicable (B228).		
Construction activities as per plan (no-go areas)	• Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049). • Disturbance exclusion zones (or management buffers) will be established and managed during construction and operations to effectively protect ESAs as defined by the project's constraints mapping (B145).	• There is documented evidence that the management hierarchy described in Section 2 has been implemented at every site of proposed activities in areas mapped as core habitat known	• Investigate the cause of non-conformance with the management hierarchy and amend the relevant processes / procedures to avoid

Mitigation	Commitment	Indicator of success	Corrective action
	• Trees will be felled away from existing vegetation not identified for removal where practicable (B150). • Damage to trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151). • Avoidance boundaries will be clearly delineated prior to clearing (B166). • Audits/checks will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167). • Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182). • Construction that will potentially affect waterways will occur during dry months (periods of low rainfall and low flow) where possible. The use of machinery and vehicles on stream beds and banks will be avoided wherever possible (B202). • Trenching will be perpendicular to the creek where the gathering line crosses waterways (B203). • Where possible trenching within or in the vicinity of watercourses will occur during the drier months of the year, which will reduce the potential for water quality decline as a result of sediment mobilisation (B205). • Buffer zones and the Project footprint will be regularly monitored using satellite imagery (B215). • Watercourse crossings will be constructed in a manner that minimises sediment release to watercourses, stream bed scouring, obstruction of water flows and disturbance of stream banks and riparian vegetation (i.e., the crossing location will be at a point of low velocity, and straight sections will be targeted, with the pipeline or road orientated as near to perpendicular to water flow as practicable) (B221). • Transport of equipment across watercourses will be avoided unless an appropriate crossing that minimises disturbance to the watercourse bed and banks and to riparian vegetation is available (B225). • Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230).	and core habitat possible for MNES • Fauna spotter catcher will be on site during clearing of any MNES • As constructed impact areas (i.e. the actual area in which clearing of any MNES has occurred) are accurately documented • The MNES impact areas are equal to or less than the impact areas shown in Tables 1.2 of this document • Significant disturbance to watercourses will occur when there is no or low flow • High risk weeds are managed as per Arrow's Weed Management Procedure (ORG-ARW-HSM-PRO-00139)	future non-conformance • Ensure fauna spotter catcher is on site during clearing of any MNES • Ensure site works / clearing boundaries are accurately marked in the field • Early and clear communication of the tracking of actual versus authorised MNES impact areas and relocate future infrastructure to avoid MNES if actual impact is expected to exceed authorised impact • Revise plans of significant disturbance to watercourses to occur when there is no or low flow or improve erosion and sediment controls when such works occur during conditions of water flow • Reinforce the requirement to follow Arrow's Weed Management Procedure
Clear Communication	• Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149).	• Records of preconstruction 'tool box' sessions / advices	• Investigate the cause of non-conformance and

Mitigation	Commitment	Indicator of success	Corrective action
		provided to construction crews demonstrating compliance	amend the relevant processes / procedures to avoid future non-conformance or apply appropriate measures if deemed a significant breach of conduct rules
Protection of topsoils	• Soil will be stripped according to designated profile depths, subject to further field investigations during stripping (B051). • Where practicable, stripped material will be placed directly onto area to be rehabilitated and spread immediately (if rehabilitation sequences and weather conditions permit) to avoid the requirement for stockpiling (B052). • Soils will be separated into windrows for later collection or re-spreading to minimise compression effects of heavy equipment (B053). • Soil transported by dump trucks may be placed directly into storage. Soil transported by scrapers will be pushed to form stockpiles by other equipment (e.g. dozer) to avoid tracking over previously laid soil to minimise compaction (B054). • Surface of soil stockpiles will be left in as coarsely structured a condition as possible to promote infiltration and minimise erosion until vegetation is established or suitable erosion controls have been applied, and to prevent anaerobic zones from forming (B055). • Pipeline construction will be conducted in a manner that limits the duration of exposure of soils. Stripped and salvaged soil will be re-used within a short period of time (i.e. 28 days) in areas where rehabilitation immediately follows the installation of pipelines (B063). • Erosion and Sediment Control Plans will be developed and maintained in accordance with the International Erosion Control Association (IECA) (2008) Best Practice Erosion and Sediment Control guidelines. All proposed erosion and sediment control measures will be implemented in advance of, or in conjunction with clearing activities (B066). • Topsoil will be stripped, salvaged and stockpiled separately from subsoils (B068). • Appropriate sediment and erosion control structures will be installed and maintained at work sites (B160).	• Erosion and Sediment Control Plans (inclusive of topsoil management specifications) in place and implemented prior to all clearing activities.	• Development and implementation of Plans

Mitigation	Commitment	Indicator of success	Corrective action
	• Best practice erosion and sediment control measures will be implement during decommissioning works in accordance with the requirements of the IECA (2008) Best Practice Erosion and Sediment Control manual (B337).		
Open trench management	• Trenches will be inspected and monitored as per the APIA Code of Environmental Practice (B159) and will be checked within two hours of sunrise and trapped fauna released. Additional inspections will be undertaken following rainfall events (SMP). • The time a trench is left open will be minimised. Fauna exit points will be incorporated when construction is within 1 km of native vegetation, using appropriate material. Fauna refuges, such as sawdust-filled bags, will be provided regularly through areas of high fauna activity (B173). • Harm to fauna from entrapment during construction and operation of dams will be prevented (B184). • As soon as practical following pipe laying, the trench will be backfilled with excavated material, compacted and topsoil replaced and erosion controls implemented (B299).	• Site records / photographs demonstrating compliance	• Investigate the cause of non-conformance and amend the relevant processes / procedures to avoid future non-conformance
Fauna spotter catcher	• Suitably qualified fauna spotter-catcher (FSC) or ecologist will capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153). The FSC will be at the site on the day of clearing. The FSC will be suitably qualified as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time (new commitment). • Trees will be assessed for potential nesting hollows prior to felling. If hollows are identified, trees will be felled in the presence of a qualified FSC and rolled so that the hollows are facing upwards, allowing fauna to escape (B189). • Key Koala trees will be identified and visually inspect prior to clearing to ensure that they are free of Koalas. If Koalas are located, the tree will be retained until the animals have moved on, typically overnight (B190). • Checks for identified EPBC Act fauna species breeding places will be undertaken immediately prior to commencing vegetation clearing (SMP). • Potential breeding places will be clearly marked in the field with spray paint, coloured flagging tape (unless not permitted by land owners, e.g. some cattle properties), or by other suitable methods (SMP).	• Review of spotter/catcher records / notes demonstrates compliance • Potential breeding places will be clearly marked in the field	• Reinforce the requirement to follow Arrow's Fauna Spotter/Catcher Work Instruction document (ORG-ARW-AND-WOI-00001) • Investigate the cause of non-conformance and amend the relevant processes / procedures to avoid future non-conformance
Appropriate	• The cleared areas and stockpiles will be progressively rehabilitated through revegetation	• Inspection of site during and	• Early and clear

Mitigation	Commitment	Indicator of success	Corrective action
rehabilitation	and/or mulching (B021). • Areas will be cleared progressively and rehabilitation implemented as soon as practicable following construction and decommissioning activities (B033). • Rehabilitation timeframes will be compliant with applicable Environmental Authority conditions and consider any landholder requirements/expectations (new commitment) • Rehabilitation plans will be developed addressing ground preparation requirements, natural and constructed drainage patterns, soil erodibility, contamination, slope steepness and length, vegetation cover, land use and landowner requirements (B064). Partial rehabilitation of gathering lines and other linear infrastructure will be undertaken to reduce edge effects (including weed invasion) and maintain movement rates (B156). • Rehabilitation of available areas will be undertaken that is consistent with pre-clearance habitats, to increase the rate of recovery (B157). • Woody debris, logs and rocks will be retained for use in rehabilitation. Where practical, these will be piled along the edge of the cleared corridor. Where possible these features will be spread over all or part of the corridor to provide refugia for crossing fauna. Systematic removal of surface debris will be avoided and cleared timber will never be burnt (B161). • Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163). • Site planning, preparation and management requirements will be implemented in accordance with a decommissioning and rehabilitation plan (B175). • After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177). • Regular monitoring of rehabilitation success will be carried out (B183). • During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186). • Excavations, particularly pipeline trenches and drilling sumps, will be backfilled and rehabilitated. Backfilling will be conducted in a manner that will promote successful rehabilitation, including capping of exposed subsoil with topsoil and replacement of the land surface to preconstruction levels to reduce trench subsidence and concentration of flow. Soils will be mounded where required to allow for settling. However, in laser-	after installation of infrastructure demonstrates compliance • That the area has been returned to pre-disturbed condition (or better) as agreed with the landholder and as required by DES in order to grant progressive rehabilitation certification and EA surrender. • Progressive rehabilitation certification is granted by the Department of Environment and Science (DES) when requested. • The EA surrender application including the Final Rehabilitation Report and landholder signoff is granted by the DES.	communication with the construction crew if inspections are not demonstrating compliance • Continued remediation and rehabilitation of the disturbed areas until the progressive rehabilitation certification is granted • Continued remediation and rehabilitation of the disturbed areas until the EA surrender application is granted

Mitigation	Commitment	Indicator of success	Corrective action
	levelled paddocks, this may not be practicable, and backfilling will be carried out in consultation with the landowner (B233). • A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339). • Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591). • A final rehabilitation report and a decommissioning plan, including a contaminated land assessment where required, landowner commitments and agreements, and rehabilitation status, will be prepared and submitted to the appropriate authorities for approval where required (B592). • The area disturbed within the pipeline corridor during the laying of the pipelines will be progressively rehabilitated as soon as practicable after completion of the pipeline installation. Fences, roads and tracks and other existing infrastructure impacted during construction of the pipeline will be repaired and/or replaced as required (B594). • At decommissioning, a suitable vegetation cover will be re-established to enable natural vegetation progression and minimal weed invasion (B606). • Final ground conditions will be rehabilitated to a state that is conducive to support further natural regeneration at project closure (B607).		
Reduce light spill	• Lighting will be designed in a manner that limits disruption on landscape character, views and visual amenity and lighting will be directed into the infrastructure siting rather than dispersed into native vegetation when sites are adjacent to intact habitat (B099).	• No lighting directed towards intact Red Goshawk, Koala, South-eastern Long-eared Bat, Large-eared Pied Bat or Greater Glider habitat	• Lighting redirected or shielded away from intact habitat
Reduce project traffic speed	• Speed limits on Project controlled roads will be developed with due consideration to reduce the potential for vehicle collisions with wildlife (B154).	• Review reports generated from Arrow's In-Vehicle Monitoring System (IVMS)	• Clear communication and warning for any IVMS breaches
Weed control	• A detailed pest management plan will be developed to mitigate and manage the potential spread of pest flora and fauna species (B152). This plan will include	• Inspection of site after installation of infrastructure	• Reinforce the requirement to follow

Mitigation	Commitment	Indicator of success	Corrective action
	requirements for machinery washdown procedures to be followed during all clearing activities (new commitment). • Weed monitoring and targeted weed control measures will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158). Weed control methods within EVNT habitats will be selected on the basis of minimising the risk of adverse impacts on EVNT species or communities (new commitment). • In accordance with the Pest Management Plan regular inspections for pest flora and evidence of pest fauna will be undertaken within Project disturbed areas (B171). • Washdown facilities will be designed to ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to adjacent areas (B172). • When sourcing maintenance materials, materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180). • All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188). • A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through Project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191).	demonstrates compliance • High risk weeds are managed as per Arrow's Weed Management Procedure (ORG-ARW-HSM-PRO-00139)	Arrow's Vehicle and Machinery Hygiene Procedure (ORG-ARW-HSM-PRO-00138) and Weed Management Procedure
Grazing	• Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites (new commitment)	• Livestock absent from infrastructure sites	• Reinstate integrity of exclusion fencing
Documentation	• A Water Management Plan, Erosion and Sediment Control Plan, and Waste Management Plan will be designed to avoid or minimise the potential impacts of Project (B207).	• Water Management Plan, Erosion and Sediment Control	• Develop and implement required plans

Mitigation	Commitment	Indicator of success	Corrective action
	• Corrective actions will be undertaken in accordance with the outcomes of incident investigations, audits, monitoring results or advice given by the relevant regulatory authority (B593). • Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480). • Any residual impacts to EPBC Act species and communities will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impact (new commitment).	Plan, and Waste Management Plan in place for the Project and Offset Strategy in place for relevant phase of the Project	• Investigate the cause of non-conformance and amend the relevant processes / procedures to avoid future non-conformance
Hazardous materials management	• Appropriate international, Australian and industry standards and codes of practice will be applied for the handling and storage of hazardous materials, such as chemicals, fuels and lubricants (B078). • Appropriate spill response equipment including containment and recovery equipment will be available onsite (B079). • Staff will be trained on appropriate handling, storage and containment practices for chemical, fuels and other potential chemicals as relevant (B083).	• Records of training provided to construction crews demonstrating compliance	• Undertake and record evidence of such training • Investigate the cause of non-conformance and amend the relevant processes / procedures to avoid future non-conformance
Bushfire	• Fire management plans will be developed for production facilities (B471). • Radiation exclusion zones around flares will be designed according to API standard (B485). • Enclosed spaces where flammable gas may accumulate will be minimised (B487). • Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499). • Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be	• Fire management plans in place and implemented prior for all production facilities	• Development and implementation of required plans • Investigate the cause of non-conformance and amend the relevant processes / procedures to avoid future non-conformance

Mitigation	Commitment	Indicator of success	Corrective action
	maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503). • Fire-safety equipment will be commissioned in the early phase of the construction period (B505). • All buildings and production facilities will be fitted with smoke or fire alarms (B506). • Fire and gas detection systems will be installed to shutdown compressors (B508). • Protocols will be developed for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns (B533). • Regular patrols and inspections of pipeline easements will be conducted, including status of signposting subsidence and of fire breaks (B536). • Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544). • Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547). • Project vehicles will not be driven or parked off-track in situations that are a high risk of igniting a grass fire (new commitment). • Daily operations will be managed with consideration of the fire danger current at that time (B548).		
Ornamental Snake management	• Where practicable, disturbance will be avoided in areas known or assessed to be suitable habitat for Ornamental Snake during the breeding season (September to April) (SMP). • If Ornamental Snake breeding activity is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated (SMP). • Soil cracks within potential Ornamental Snake habitat that could harbour snakes will be marked with spray paint. A borescope, or similar equipment, will be used to determine the presence of a snake. If a snake is found, the spotter-catcher will attempt to dig up the soil crack and remove the animal (SMP). • Spotlighting will be completed in line with Arrow's Ornamental Snake Guideline (ORG-ARW-HSM-GUI-00101, Section 8) when the following are met:	• Review of spotter/catcher records / notes demonstrates compliance	• Reinforce the requirement to follow Arrow's Ornamental Snake Guideline (ORG-ARW-HSM-GUI-00101)

Mitigation	Commitment	Indicator of success	Corrective action
	– Prior to commencing construction activities that involve significant ground disturbance, and – Within the breeding and high activity period of September to April (SMP). • Ornamental Snakes captured will be retained by a licensed FSC for the duration of the day's construction activities and released in a suitable habitat in close proximity to the site boundaries that evening (i.e. within 24 hours), or retained and released in line with the FSC's permits if construction is ongoing (SMP).		
Squatter Pigeon specific management	• If Squatter Pigeon breeding activity is observed, an exclusion zone (50 m radius) will be enforced until the breeding place is vacated (SMP). • Removal or relocation of individual Squatter Pigeon's, young or eggs will only be undertaken after measures have been taken to avoid and minimise impacts on the identified active breeding place as per the management hierarchy described in Section 2. (SMP). • As a last resort, Squatter Pigeon eggs or young would be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release (SMP).	• Review of spotter/catcher records / notes demonstrates compliance	• Reinforce the requirement to follow Arrow's SMP commitments relating to Squatter Pigeon
Red Goshawk specific management	• The probability of Red Goshawk nesting in the BGP is considered low. However, should a potential nest be identified in proximity to existing or proposed project activities Arrow (with Construction Contractor) would: – Stop work at the location. – Notify Arrow so that Arrow may notify the relevant authorities (i.e. DotEE and DES). – Seek approval from DotEE for additional disturbance if any impact is 'significant' and unavoidable. – Manage the species or community in accordance with the mitigation measures listed in Appendix C and all applicable conditions of approval including the Offset Strategy for the relevant Project phase. – Tag/barricade the identified species/community in an appropriate manner to ensure protection. – Cease clearing works in the immediate area. – Record GPS coordinates so that it may be incorporated into the Site	• Review of spotter/catcher records / notes demonstrates compliance	• Reinforce the requirement to follow Arrow's SMP commitments relating to Red Goshawk

Mitigation	Commitment	Indicator of success	Corrective action
	Environmental Map as a 'no-go zone' or recorded as an impact area. – Provide all relevant information to Arrow for monthly tracking of EPBC Act species and community impacts for annual reporting (SMP).		
Koala specific management	• If a Koala is found within the clearing footprint; a minimum exclusion zone of 100 m will be established for a female Koala with obvious young and 50 m for all other Koala, until the animal has moved of its own accord. No vehicles are to enter the buffer (exclusion) zone at any time. Vehicle operators will be made aware of the presence of the Koala and a reduced speed limit established until the animal has moved on of its own accord (SMP).	• Review of spotter/catcher records / notes demonstrates compliance	• Reinforce the requirement to follow Arrow's SMP commitments relating to the Koala
South-eastern Long-eared Bat specific management	• All reasonable and practicable attempts (if safe to do so) will be made to check hollow bearing trees, hollow logs, peeling bark and splits in tree trunks for the presence of South-eastern Long-eared Bat (SMP). • If breeding activity of South-eastern Long-eared Bat is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated (SMP). • As a last resort, South-eastern Long-eared Bat young may be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release (SMP). • Where hollows containing South-eastern Long-eared Bat maternity sites have been identified that are inactive and unavoidable, the FSC will determine whether it is to be relocated or left in situ (SMP). • Where relocation of South-eastern Long-eared Bat in tree hollows is required, an elevated work platform or cherry-picker may be used in conjunction with a chainsaw operator and the FSC (or a FSC who holds a current training qualification in use of chainsaws) to attempt to remove the hollow. The following step-by-step process (modified from Nottidge, 2012) will be considered if safe to do so: – The FSC (with chainsaw operator unless the FSC is a qualified chainsaw operator) will inspect each visible hollow or potential breeding place (e.g. nest) identified in each tree using the cherry picker. This is usually carried out by simply looking into hollows and nests (with the assistance of a small torch); however, fibrescopes may also be useful for deep hollows. – If bats are located within a hollow, a piece of towel or rag would be firmly placed in the entrance to prevent the wildlife from escaping, as they may attempt to flee the nesting/denning hollow.	• Review of spotter/catcher records / notes demonstrates compliance	• Reinforce the requirement to follow Arrow's SMP commitments relating to the South-eastern Long-eared Bat

Mitigation	Commitment	Indicator of success	Corrective action
	– Once the hollow entrance has been secured, the chainsaw operator will remove the entire hollow limb below the cavity where the branch remains solid. In circumstances where a hollow continues into the main stem of the tree, the chainsaw operator would carefully cut a small window into the hollow, allowing the FSC to plug the hollow above and below the window, then the hollow limb is removed and lowered to the ground in sections. – When the bats have been safely secured within its hollow, the entire limb would then be placed in the cherry-picker bucket or lowered to the ground using ropes (depending on the size of the limb). – This limb would be placed in a cool, quiet location until translocation to the recipient habitat site, when at dusk of the same day the hollow entrance will be reopened to allow the bats to emerge of their own accord.		
Large-eared Pied Bat specific management	• All reasonable and practicable attempts (if safe to do so) will be made to check suitable caves for the presence of Large-eared Pied Bat (new commitment).	• Review of spotter/catcher records / notes demonstrates compliance	• Reinforce the requirement to check any suitable caves for Large-eared Pied Bats

6. Consistencies with relevant documents

Condition 9(d): A discussion of relevant conservation advice, recovery plans and threat abatement plans and how measures proposed in the EPBC SIMP are consistent with the measures in these documents.

Table 6.1 identifies existing Conservation Advice, Recovery Plans and Threat Abatement Plan relating to each EPBC Act species and community and describes how this SIMP is consistent with these documents.

Table 6.1 Relevant documents for each EPBC Act species and community

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
Black Ironbox	• Advice dated November 2008 (DEWHA, 2008a) • Manage Habitat disturbance, smothering by *Cryptostegia grandiflora* (Rubber Vine), increased fire frequency from fuel associated with weeds and introduced grasses, increased stream bank erosion.	• Not required – see conservation advice	• No Plan has been identified as being relevant for this species (DotEE, 2018a) • Key threats are provided in the conservation advice	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Inadvertent clearing and habitat disturbance - Weeds (particularly Rubber Vine) - Fire - Increased stream-bank erosion
Bluegrass (*Dichanthium setosum*)	• Advice dated March 2008 (DEWHA, 2008b) • Manage livestock grazing, habitat clearing, frequent fires, introduced grasses and road widening.	• Not required – see conservation advice	• The *Threat abatement plan for competition and land degradation by rabbits* (DotEE, 2016) is identified as relevant	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and disturbance - Grazing - Weeds and feral herbivores - Fire Mitigation measures are also described for an additional identified project specific threat; namely, soil compaction and mixing

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
King Bluegrass	• Advice dated January 2013 (DSEWPAC, 2013) • Manage loss of habitat, (through agricultural and mining activities, road construction and other infrastructure developments), cultivation for crop production, grazing and invasion from weeds such as Parthenium Weed and *Parkinsonia aculeata* (Parkinsonia)	• Required (being prepared) – see conservation advice	• No Plan has been identified as being relevant for this species (DotEE, 2018d) • Key threats are provided in the conservation advice	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss and disturbance - Grazing - Weeds. • Mitigation measures are also described for an additional identified project specific threat; namely, soil compaction and mixing.
Ornamental Snake	• Advice dated Apr 2014 (DoE, 2014) • Feeds almost exclusively on frogs • Associated with periodically or permanently inundated areas • Manage habitat loss and degradation, destruction of wetlands and frog habitats (including by pigs), poisoning by Cane Toads	• Not required – see conservation advice	• No Plan has been identified as being relevant for this species (DotEE, 2018e) • Key threats are provided in the conservation advice	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss and degradation, including destruction of wetlands and frog habitats - Pigs and cane toad abundance • Mitigation measures are also described for an additional identified project specific threat; namely, direct injury or mortality including through entrapment in open trenches and during dam construction

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
Squatter Pigeon	• Advice dated Oct 2015 (TSSC, 2015a) • Nests on the ground • Manage habitat loss and fragmentation, overgrazing by livestock and rabbits, weeds, inappropriate fire regimes, predation by feral cats and fox and illegal shooting	• Not required – see conservation advice	• The *Threat abatement plan for predation by cats* (DoE, 2015a) is identified as relevant • *The threat abatement plan for competition and land degradation by rabbits* (DotEE, 2016) is identified as relevant • The *Threat abatement plan for predation by European red fox* (DEWHA, 2008c) is identified as relevant • Squatter Pigeon identified as a species being affected by rabbits (through habitat degradation) and by feral cats (through predation).	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and disturbance - Grazing - Increased abundance of rabbits, feral cata, foxes and weeds - Fire - Illegal shooting • Mitigation measures are also described for an additional identified project specific threat; namely, direct injury or mortality
Red Goshawk	• Advice dated October 2015 (TSSC, 2015b) • Manage habitat loss (including loss of wetlands and hollow-bearing tree , where prey breed), fragmentation and degradation (including through overgrazing by livestock and feral herbivores and altered fire regimes)	• National recovery plan for the red goshawk (DNRM, 2012) • Manage habitat loss and fragmentation, threats to prey base and paucity of information	• No Plan has been identified as being relevant for this species (DotEE, 2018g) • Key threats are provided in the conservation advice	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and disturbance

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
				- Grazing - Increase feral herbivore numbers - Fire • Mitigation measures are also described for an additional identified project specific threat; namely, direct injury or mortality
Koala	• Advice dated April 2012 (DSEWPAC, 2012a) • Manage habitat loss and fragmentation, vehicle strike, disease and predation by dogs	• Multiple National and State-based plans	• Multiple National and State-based plans	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss and fragmentation - Direct injury or mortality (including by vehicle strike) - Disease - Predation by dogs
South-eastern Long-eared Bat	• Advice dated October 2015 (TSSC, 2015) • Manage habitat loss and fragmentation, reduction in hollow availability, fire, exposure to agrichemicals, grazing and predation by feral animals	• Required – included on the 'Commenced' list • Recovery objectives are to increase understanding of basic ecology and to clarify distribution and abundance	• No Plan has been identified as being relevant for this species (DotEE, 2018i) • Key threats are provided in the conservation advice	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and reduction of hollow availability - Fire - Exposure to agrichemicals

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
				- Grazing - Predation by feral animals • Mitigation measures are also described for an additional identified project specific threat; namely, direct injury or mortality
Large-eared Pied Bat	• There is no approved Conservation Advice for this species • Key threats are provided in the Commonwealth Listing Advice (TSSC, 2010) • Manage disturbance and damage at primary nursery roosts by animals and humans (recreational activities associated with cliffs), loss of foraging habitat and predation by foxes and other predators	• National recovery plan for the large-eared pied bat *Chalinolobus dwyeri* (DERM, 2011). • Minimise impacts associated with the destruction of, and interference with maternity and other roosts	• No Plan has been identified as being relevant for this species (DotEE, 2018j) • Key threats are provided in the Commonwealth Listing Advice (TSSC, 2010)	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and disturbance - Predation by foxes and other predators - Disturbance and damage to primary nursery roosts by animals and humans • Mitigation measures are also described for an additional identified project specific threat; namely, direct injury or mortality
Greater Glider	• Advice dated May 2016 • Cumulative effects of clearing and logging activities, current burning regimes and the impacts of climate change are a major threat to large hollow-bearing trees on which the species relies	• Required – see conservation advice	• No Plan has been identified as being relevant for this species (DotEE, 2018k) • Key threats are provided in the conservation advice	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and degradation (including reduction of hollow availability)

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
				- Fire • Mitigation measures are also described for an additional identified project specific threat; namely, direct injury or mortality
Painted Honeyeater	• Advice dated July 2015 • Habitat loss is the key threat to this species.	• Required– see conservation advice	• No Plan has been identified as being relevant for this species (DotEE, 2018l) • Key threats are provided in the conservation advice	• Appendix C provides a species profile that identifies the proposed management measures for addressing key threats. The species specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss and degradation - Vehicle strike • Mitigation measures are also described for an additional identified project specific threat; namely, direct injury or mortality
Brigalow (*Acacia harpophylla* dominant and co-dominant)	• Advice dated December 2013 (DoE, 2013) • Qld Government *Brigalow and Other Lands Development Act 1962* and *Brigalow Development Scheme* encouraged and funded the clearing of Brigalow to increase cattle stocking rates • Key threats to remaining populations are clearing, fire, weeds, feral animals and grazing	• Required – see conservation advice	• The *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* (DSEWPAC, 2011) is identified as relevant.	• Appendix C provides a TEC profile that identifies the proposed management measures for addressing key threats. The TEC specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and disturbance - Fire - Weeds and feral animals - Grazing

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
Weeping Myall Woodlands	• Advice dated December 2008 (DEWHA, 2008d) • Manage clearing and degradation for agriculture and from overgrazing, weed invasion and herbivory by caterpillars of the Bag-shelter Moth	• Required – see conservation advice	• The *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* (DSEWPAC, 2011) is identified as relevant	• Appendix C provides a TEC profile that identifies the proposed management measures for addressing key threats. The TEC specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss and disturbance - Grazing - Weeds
Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin	• Advice dated December 2008 (DEWHA, 2008f) • Manage grazing, cropping and pasture improvement, weeds and pest animals, mining activities and construction of roads and other infrastructure	• Required – see conservation advice	• The *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* (DSEWPAC, 2011) is identified as relevant	• Appendix C provides a TEC profile that identifies the proposed management measures for addressing key threats. The TEC specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the following threats, as identified in the conservation advice: - Habitat loss, fragmentation and disturbance - Weeds and feral animals - Grazing • Mitigation measures are also described for an additional identified project specific threat; namely, soil compaction and mixing
Semi-evergreen vine thickets of the Brigalow Belt (North and	• There is no approved Conservation Advice for this species • Key threats are provided in the EPBC Act Species Profile and	• Required – see conservation advice	• The *Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads* (DSEWPAC, 2011) is	• Appendix C provides a TEC profile that identifies the proposed management measures for addressing key threats. The TEC specific mitigation measures described in Appendix C are grouped and have been selected on the basis that they address the

EPBC Act species / communities	Conservation Advice	Recovery Plan	Threat Abatement Plan	SIMP Consistency and Threats Addressed
South) and Nandewar Bioregions	Threats Database (DotEE, 2018n) • Manage clearing, fragmentation, fire, weeds, feral animals and inappropriate grazing		identified as relevant. • The *Threat abatement plan for predation, habitat degradation, competition and disease transmission by feral pigs (*Sus scrofa*)* (DotEE, 2017) is identified as relevant.	following threats, as identified in the conservation advice: - Habitat loss, fragmentation and disturbance - Fire - Weeds and feral animals - Grazing

7. Process for addressing impacts to EPBC species or communities not identified in Table 1 of the BGP approval

Condition 9(e): Details of how the approval holder has addressed any residual significant impacts to any EPBC listed threatened species and its habitat and/or EPBC communities not identified in Table 1, to be offset in accordance with the EPBC Act Environmental Offsets Policy.

Infrastructure location planning and post-EIS flora and fauna surveys completed to date have not identified any unavoidable residual significant impacts that are additional to those identified in Table 1 of the BGP approval.

Nonetheless, the following sets out Arrow's process for address any such additional impacts should they be identified as unavoidable during the BGP's ongoing planning, construction, operation and decommissioning activities:

- When the BGP activities proceed through the detailed design and planning phase and secondary approvals are required (e.g. an Environmental Authority or a landholder agreement) a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist. The pre-clearance survey will confirm the presence, absence and extent of environmental values (including EPBC Act species habitats) and these will be mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint.
- If the above survey identifies an EPBC Act species not listed in Table 1 of the EPBC approval, this information will be collated and reported to Arrow Environment Manager within 24hrs of identification. A more detailed assessment will then be undertaken to identify if the new EPBC Act species can be avoided or the extent to which impacts can be minimised. Information on the finding and potential impacts will be prepared and notification provided to DotEE and DES.
- Arrow will notify the Department of potential non-compliance with any condition of approval as soon as practical and within no later than 10 business days of becoming aware of the potential non-compliance.
- Approval for additional unavoidable residual significant impacts to any EPBC Act species or community (including any of these which were not in Table 1 of the EPBC approval) will be sought.
- Any residual impacts to EPBC species or communities not identified in Table 1 of the BGP approval will be offset in accordance with the approval granted through the previous dot point and the EPBC Act Environmental Offsets Policy. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases

will be developed and implemented to add value rather than just compensating for impacts.

- Prior to any ground disturbance activities, Arrow will appoint a Construction Contractor and will include in the relevant contract document the requirement for:
  - A CEMP to be prepared and submitted to Arrow for approval prior to any construction activities.
  - A key values Management Plan specific to 'Clearing' (a Clearing Management Plan).
  - The Clearing Management Plan is to include a process for an unplanned encounter with an EPBC listed threatened species or EPBC community. The plan is to commit the Construction Contractor to the following process as a minimum:
    - Stop work at site where unplanned disturbance to an EPBC listed threatened species, its core habitat, or TEC is encountered.
    - Notify Arrow that an EPBC Act species or community has been identified in a new area so that Arrow may, where appropriate, notify the relevant authorities (i.e. DotEE and DES).
    - Seek approval from DotEE for additional disturbance if impacts are 'significant' and unavoidable.
    - Manage the species or community in accordance with all applicable conditions of approval including the Offset Strategy for the relevant Project Phase.
    - Tag/barricade the identified species/community in an appropriate manner to ensure protection.
    - Cease clearing works in the immediate area to protect the identified species/community.
    - Record species/community GPS coordinates so that it may be incorporated into the Site Environmental Map as a 'no-go zone' or recorded as an impact area.
    - Provide all relevant information to Arrow for monthly tracking of EPBC Act species and community impacts for annual reporting.

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APPENDIX B

BGP EPBC Act species and community core habitat mapping rules

The following table sets out the core habitat mapping rules that have been applied to EPBC Act species and communities for the BGP area. The areas identified for each species and community are illustrated in Appendix D.

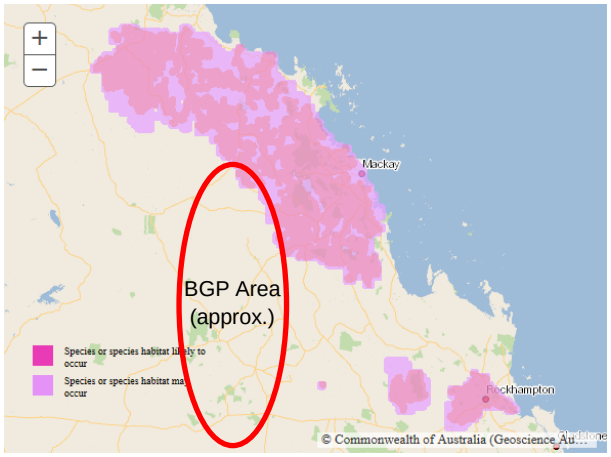
MNES	Core Habitat Known	Core Habitat Possible
All Regional Ecosystem (RE) mapping has been applied in the following order of priority: 1. Ecosmart ground-truthed REs (Phase 1 area) 2. Queensland Government RE mapping (V10) 3. Queensland Government Mature Regrowth (EPA) (as a proxy for regrowth > 15yrs)		
Black Ironbox (*Eucalyptus raveretiana*)	Any RE polygon that contains a species record (recent (1980+) and accurate (± 500m).	• Remnant vegetation on land zone 3 within 200m of watercourse • REs: 11.3.4 and 11.3.25 • Remnant vegetation should be from 0-300m AHD
Bluegrass (*Dicanthium setosum*)	Species records (recent (1980+) and accurate (± 500m)) should be buffered by a 1 km diameter. This includes remnant and non-remnant habitats.	• REs: 11.3.2, 11.3.3, 11.3.4, 11.3.21, 11.4.4, 11.4.11, 11.8.11 and 11.9.3
King Bluegrass (*Dichanthium queenslandicum*)	Species records (recent (1980+) and accurate (± 500m)) should be buffered by a 1 km diameter. This includes remnant and non-remnant habitats.	• REs: 11.3.21, 11.4.4, 11.4,11, 11.8.5, 11.8.11 and 11.9.3
Ornamental Snake (*Denisonia maculata*)	All land within 1km of a species record (recent (1980+) and accurate (± 500m))	• All remnant vegetation on land zone 3, 4, 8 and 9 • Also, remnant RE11.5.16
Squatter Pigeon (Southern) (*Geophaps scripta scripta*)	All land (remnant or non-remnant), within 1 km of a recent (1980+) and accurate (± 500 m) record	Woodlands, native grasslands and derived native grasslands REs consisting of: 11.3.2, 11.3.3, 11.3.4, 11.3.14, 11.3.17, 11.3.18, 11.3.19, 11.3.21, 11.3.25, 11.3.26, 11.4.4, 11.4.11, 11.4.12, 11.5.1, 11.5.4, 11.5.20, 11.7.4c, 11.8.2a, 11.8.11, 11.9.3, 11.9.9, 11.9.10) Mature Regrowth (EHP 2012b) is also included in the mapping assessment
Red Goshawk (*Erythrotriorchis radiatus*)	Species records (<500 m precision) should be buffered by a 1 km diameter and classed as 'core habitat known'. This includes only remnant habitats.	Remnant woodland within 1 km of permanent water. Permanent water is stream order 3 and above. Following REs were excluded: 11.1.1, 11.1.3, 11.2.2, 11.3.21, 11.3.24, 11.3.31, 11.4.11, 11.4.4, 11.5.14, 11.5.6, 11.8.10, 11.8.11, 11.9.12, 11.9.3, and 11.11.17.
Koala (*Phascolarctos cinereus*)	All core habitat possible within 1km of a species record (<500 m precision).	REs: 11.3.2, 11.3.3, 11.3.4, 11.3.14, 11.3.17, 11.3.18, 11.3.25, 11.3.26, 11.3.27d and 11.3.27f
South-eastern Long-Eared Bat (*Nyctophilus corbeni*)	Any RE polygon containing a recent (1980+), accurate (± 500 m). unless it is a heterogeneous polygon that includes >65% grasslands (i.e RE11.3.21 + 11.4.4 + 11.4.11 + 11.8.11	All remaining remnant vegetation (except REs 11.3.21, 11.4.4, 11.4.11, 11.8.11 and 11.9.3)

	+ 11.9.3). Such areas should be excluded. Note that no accurate sightings currently recorded in BGP	
Large-eared Pied Bat (*Chalinolobus dwyeri*)	Any RE polygon containing a recent (1980+), and accurate (± 500 m) record. Note that no accurate sightings currently recorded in BGP	Any RE polygon within 10km of a recent, accurate record is classed as core habitat Possible (Note there are no records currently). Cliffs (and surrounding REs) within 10 km of remnant or regrowth vegetation should be classed as core habitat possible (including vegetation)
Greater Glider (*Petauroides volans*)	All 'General Habitat' (i.e. REs: 11.3.6, 11.3.9, 11.4.13, 11.5.9, 11.5.12, 11.7.4, 11.8.4, 11.8.14, 11.9.1, 11.10.4, .11.10.5, 11.10.7, 11.11.1, 11.12.1, 11.12.2) and 'Core Habitat Possible' within 1km of a recent (1980+), accurate (± 500m) record. Note that no formal sightings currently recorded in BGP	REs: 11.3.1, 11.3.2, 11.3.3, 11.3.4, 11.3.25, 11.3.27 (in fringing woodlands), 11.3.36, 11.3.37, 11.4.2, 11.4.7, 11.4.8, 11.5.2, 11.5.3, 11.5.17, 11.7.6, 11.8.15, 11.9.2, 11.9.7, 11.9.9, 11.9.10, 11.9.13, 11.10.1, 11.12.12, 11.10.13, 11.11.9, 11.11.16, and 11.12.3.
Painted Honeyeater (*Grantiella picta*)	All "General Habitat" (i.e. REs: 11.5.11 and 11.7.2) and "Core Habitat Possible" within 2km of a recent (1980+), accurate (± 500m) record is classed as "Core Habitat Known". Note that no sightings currently recorded in BGP	REs and regrowth >15yrs: 11.3.1, 11.4.1, 11.4.7 and 11.4.8, 11.4.9, 11.5.16, 11.7.1, 11.8.3, 11.8.13, 11.9.1, 11.9.4, 11.9.5, 11.9.10, 11.10.3, 11.11.13, and 11.11.16
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Ground-truthed REs: 11.3.1, 11.4.7, 11.4.8, 11.4.9, 11.5.16, 11.9.1, 11.9.5. Use remnant and regrowth.	State Govt mapped REs: 11.3.1, 11.4.7, 11.4.8, 11.4.9, 11.5.16, 11.9.1, 11.9.5. Use remnant and regrowth.
Weeping Myall Woodlands	All core habitat possible within 1km of a TEC record. Note that no Weeping Myall Woodland TEC areas currently known in BGP	REs: 11.3.2, 11.3.28 Remnant only
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Ground-truthed REs: 11.3.21, 11.8.11, 11.4.4, 11.4.11 and 11.9.3 (where ground-truthed use Best and Good)	State Govt mapped REs: 11.3.21, 11.8.11, 11.4.4, 11.4.11 and 11.9.3
Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Ground-truthed REs: 11.5.15, 11.8.3, 11.8.13, 11.3.11, 11.4.1, 11.9.4, 11.11.18, 11.7.1x1 Remnant only	State Govt REs: 11.5.15, 11.8.3, 11.8.13, 11.3.11, 11.4.1, 11.9.4, 11.11.18, 11.7.1x1 Remnant only

APPENDIX C

EPBC Act species and communities profiles

Black Ironbox – *Eucalyptus raveretiana*



Black Ironbox distributiuon map (DotEE, 2018a)

Photo: 2018 Reef Catchments

Status

Vulnerable (EPBC Act); Least Concern (Qld Nature Conservation Act)

Distribution and Habitat

Black Ironbox is endemic to central coastal and sub-coastal Queensland and occurs in scattered and disjunct populations, from Charters Towers and Ayr, and south to Rockhampton (Qld Govt, 2018a).

It is restricted to the banks of ephemeral and permanent creek and rivers, or in coastal areas may also be an emergent to rainforest on alluvium.

Records relevant to BGP

Black Ironbox was recorded within a number of watercourses in the north-east of the BGP area during the EIS, including along Bee Creek, Blenheim Creek and Hail Creek. Likewise, the Qld Govt (2018a) sighting records show several locations within or adjoining the north-east of the BGP area.

Presence of habitat within BGP area

The Queensland Government's potential habitat modelling for the species shows modelled potential habitat is limited to the north-eastern portions of the BGP Area (Butler and Laidlaw, 2012a).

Core habitat for the species within the BGP has been mapped and is illustrated in the figure at Appendix D.1.

However it will be relatively easy for the preclearance surveys to confirm the presence of this obvious (tree) species. As such, the results of ongoing pre-clearance surveys will be taken into account in confirming and calculating actual areas of impact to core habitat within the BGP area (if any).

The BGP Area only includes a small proportion of the known distribution of the species.

General threats

The main threats to Black Ironbox are habitat disturbance and smothering by Rubber Vine, increased fire frequency from fuel associated with weeds and introduced grasses and increased stream bank erosion (DEWHA, 2008a). Besides Rubber Vine, other creek bank weeds capable of inhibiting seeding establishment include *Lantana camara* (Lantana), *Jatropha gossypiifolia* (Bellyache Bush), *Ziziphus mauritiana* (Chinee Apple) and robust introduced grasses, such as *Megathyrsus maximus* (Green Panic) (Arrow Energy, 2014).

BGP specific threats

Disturbance of up to a maximum of 258.32 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377). This area was based on the area of Regional Ecosystems that were identified by the EIS as having suitable structural characteristics to support the species. However, impacts upon habitat actually supporting the species (if any) are likely to be much less and will be confirmed and quantified by preclearance survey.

In the absence of appropriate mitigation measures, the BGP would have the potential to inadvertently remove Black Ironbox individuals and disturb habitat, increase the distribution of Rubber Vine, Lantana, Bellyache Bush, Chinee Apple and other weeds and introduced grasses and contribute to changed fire frequency and increased stream bank erosion.

BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Inadvertent Black Ironbox clearing and habitat disturbance

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that Black Ironbox habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)
- Removing riparian vegetation will be avoided when directional drilling and right of ways will be reduced where practical (B138)
- Access tracks and pipelines will deviate around sensitive vegetation where

practicable (B140)

- Sensitive infrastructure design principles will be applied to avoid watercourse, drainage lines and riparian areas where practicable (B142)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Any residual impacts to Black Ironbox (as confirmed by pre-clearance survey) will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Weeds (particularly Rubber Vine)

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180)
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles

and responsibilities, and requirements for training (B480)

- Radiation exclusion zones around flares will be designed according to API standard (B485)
- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)
- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns, will be developed (B533)
- Regular patrols and inspections of pipeline easements will be conducted, including assessment of the status of signposting subsidence and of fire breaks (B536)
- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Increased streambank erosion

- Buffer zones will be adopted for Project activities (with the exception of required creek crossings), in different areas of constraint, as defined by the Project's constraints mapping (outlined in Section 7 and detailed in Constraints Mapping (Appendix BB of the EIS) (B196)
- Tracks will be restricted in riparian zones and durations of impacts minimised, except in the immediate vicinity of creek crossings (B199)
- During the design and construction of waterway crossings, care will be taken to minimise the footprint of the structure and to avoid unnecessary disturbance to stream beds and banks (B201)
- Construction that will potentially affect waterways will occur during dry months (periods of low rainfall and low flow) where possible. The use of machinery and vehicles on stream beds and banks will be avoided wherever possible (B202)
- Trenching will be perpendicular to the creek where the gathering line crosses waterways (B203)
- Where practical the width of the easement will also be narrowed at these points, further

reducing impacts on stream banks, beds and riparian zones by restricting the area of waterway that would be disturbed (B204)

- Where possible trenching within or in the vicinity of watercourses will occur during the drier months of the year, which will reduce the potential for water quality decline as a result of sediment mobilisation (B205)
- Gathering line and access road creek crossings will be kept to a minimum where possible (B206)
- A Water Management Plan, Erosion and Sediment Control Plan, and Waste Management Plan will be designed to avoid or minimise the potential impacts of Project (B207)
- Watercourse crossings will be minimised, where practicable, during route selection. Where required, crossing locations will be selected to avoid or minimise disturbance to aquatic flora, waterholes, watercourse junctions and watercourses with steep banks (B220)
- Watercourse crossings will be constructed in a manner that minimises sediment release to watercourses, stream bed scouring, obstruction of water flows and disturbance of stream banks and riparian vegetation (i.e., the crossing location will be at a point of low velocity, and straight sections will be targeted, with the pipeline or road orientated as near to perpendicular to water flow as practicable) (B221)
- Transport of equipment across watercourses will be avoided unless an appropriate crossing that minimises disturbance to the watercourse bed and banks and to riparian vegetation is available (B225)
- Watercourse crossings will be designed to enable passage of flows resulting from a 1 in 100 year average recurrence interval flood event, as a minimum (B226)
- Gathering lines and tracks will be designed to avoid watercourses, drainage lines and riparian areas (particularly permanent watercourses or perennial aquatic habitat), where practicable (B227)
- Pipeline RoWs widths will be designed to be narrower at watercourse crossings, where practicable (B228)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- For areas mapped as core habitat for the Black Ironbox, the pre-clearance survey will include searches for individual plants
- Based on the presence of any Black Ironbox individuals (rather than solely on the basis of

potential core habitat areas (as mapped in the EIS), the coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting

- Pipeline RoWs will be routinely inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095)
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

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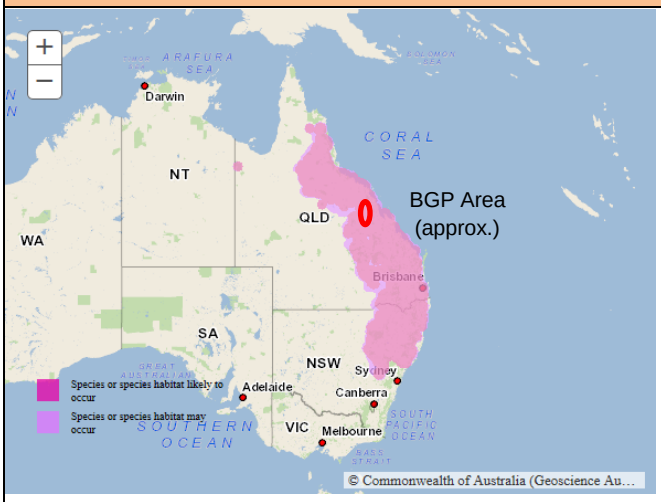
Bluegrass – *Dichanthium setosum*



Bluegrass distributiuon map (DotEE, 2018c)

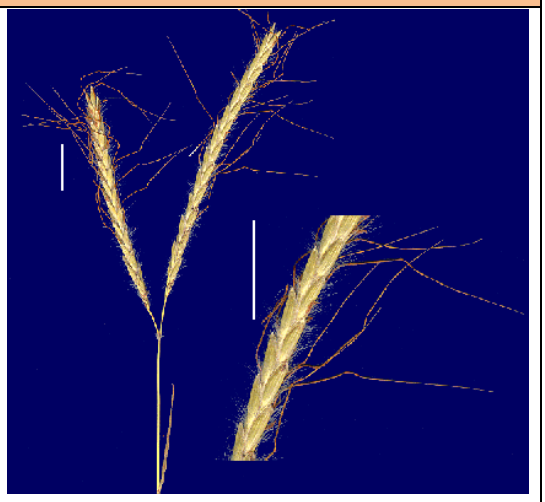


Photo: AusGrass2, 2016a

Status

Vulnerable (EPBC Act); Least Concern (Qld Nature Conservation Act)

Distribution and Habitat

Bluegrass occurs in northern NSW, particularly between Armidale and Narrabri and in Queensland it has been recorded within Leichhardt, Moreton, North Kennedy and Port Curtis regions (DEWHA, 2008b). DotEE (2018c) maps the species as potentially occurring in areas within 500km of the coast from Sydney in the south to Cooktown in the north.

Bluegrass is associated with heavy basaltic black soils and stony red-brown hard-setting loam with clay subsoil (Ayers *et al*., 1996 as cited in DEWHA, 2008b). Specimens appear tolerate of disturbance having been collected from highly disturbed and cleared pasture land.

Bluegrass can be locally common and dominant or found as scattered clumps within broader populations (OEH, 2017). Predicting suitable habitat is difficult due to its extensive distribution and breadth of environmental tolerances (OEH, 2017).

The Queensland Government's potential habitat modelling for the species shows modelled potential habitat extending throughout large portions of the BGP area (Butler and Laidlaw, 2012b).

Records relevant to BGP

Bluegrass is known to occur in the BGP area having been recorded during the EIS in open ironbark, bloodwood and mountain coolabah woodlands (Arrow Energy, 2014)

Presence of habitat within BGP area

Predicting suitable habitat is difficult due to its extensive distribution and breadth of environmental tolerances (OEH, 2017). The Queensland Government's potential habitat modelling for the species shows modelled potential habitat extending throughout large portions of the BGP area (Butler and Laidlaw, 2012b).

Core habitat for the species within the BGP has been mapped and is illustrated in the figure at Appendix D.2.

General threats

Heavy grazing by livestock (and introduced animals, e.g. rabbits (DotEE 2018c)), loss of habitat through clearing for pasture improvement and cropping, road widening, too frequent fires and invasion by introduced herbs, such as Lippia, and grasses, such as *Hyparrhenia hirta* (Coolatai Grass) and African Lovegrass, are identified threats (DEWHA, 2008b).

BGP specific threats

Disturbance of up to a maximum of 809.59 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377).

Without adequate mitigation measures in place, BGP activities would have the potential to remove, fragment and disturb additional habitat, alter fire frequency, introduce new weeds and increase weed frequency. Both Coolatai Grass and African Lovegrass occur in the BGP area, so there is potential for these and other invasive grasses to be spread. BGP activities also have to potential to impact this species through soil compaction (to cracking clay soils) and mixing.

BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Habitat loss, fragmentation and disturbance

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the Project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that Bluegrass habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)
- Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Access tracks and pipelines will deviate around sensitive vegetation where

practicable (B140)

- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339)
- Any residual impacts to Bluegrass (as confirmed by pre-clearance survey) will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites
- See also mitigation measures for pest animals below (which address the potential for the project to contribute to an increase in feral herbivores (e.g. rabbits).

Weeds and feral herbivores

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through Project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180)
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as brigalow and native grasslands) (B158)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480)
- Radiation exclusion zones around flares will be designed according to API standard (B485)
- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)
- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns, will be developed (B533)
- Regular patrols and inspections of pipeline easements will be conducted, including assessment of the status of signposting subsidence and of fire breaks (B536)
- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Soil compaction and mixing

- Stripped and salvaged soil will be re-used within a short period of time in areas where rehabilitation immediately follows installation of low key infrastructures (B040)
- Topsoil and associated vegetation will be appropriately stockpiled separately for

rehabilitation prior to excavation or earthworks (B042)

- Soil will be stripped according to designated profile depths, subject to further field investigations during stripping (B051)
- Where practicable, stripped material will be placed directly onto area to be rehabilitated and spread immediately (if rehabilitation sequences and weather conditions permit) to avoid the requirement for stockpiling (B052)
- Soils will be seperated into windrows for later collection or re-spreading to minimise compression effects of heavy equipment (B053)
- Soil transported by dump trucks may be placed directly into storage. Soil transported by scrapers will be pushed to form stockpiles by other equipment (e.g. dozer) to avoid tracking over previously laid soil to minimise compaction (B054)
- Surface of soil stockpiles will be left in as coarsely structured a condition as possible to promote infiltration and minimise erosion until vegetation is established or suitable erosion controls have been applied, and to prevent anaerobic zones from forming (B055)
- Pipeline construction will be conducted in a manner that limits the duration of exposure of soils. Stripped and salvaged soil will be re-used within a short period of time (i.e. 28 days) in areas where rehabilitation immediately follows the installation of pipelines (B063)
- Rehabilitation plans will be developed addressing ground preparation requirements, natural and constructed drainage patterns, soil erodibility, contamination, slope steepness and length, vegetation cover, land use and landowner requirements (B064)
- Topsoil will be stripped, salvaged and stockpiled separately from subsoils (B068)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- For areas mapped as core habitat for the Bluegrass, the pre-clearance survey will include searches for individual plants
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting
- Pipeline RoWs will be routinely inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095)
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native

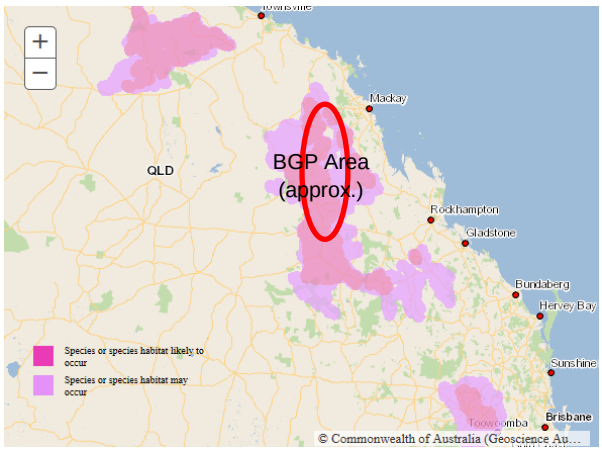
grasslands) (B158)

- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- Arrow Energy (2014). Supplementary Report to the Bowen Gas Project Environmental Impact Statement.
- AusGrass2 – Grasses of Australia (2016a). Online resource accessed via http://ausgrass2.myspecies.info/ on 29 March 2018.
- Butler, D. and Laidlaw, M. (2012b). Potential habitat model for *Dichanthium setosum*. Map date 31/08/2012. Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=10401#!lightbox-uid-0 on 29 March 2018.
- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018c). Species Profile and Threats Database – *Dichanthium setosum* – bluegrass. SPRAT Profile. Sourced from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=14159 on 29 March 2018.
- DEWHA (2008b). *Approved Conservation Advice for* Dichanthium setosum. Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/14159-conservation-advice.pdf. In effect under the EPBC Act from 26-Mar-2008.
- Office of Environment and Heritage (OEH) (2017). Bluegrass – profile. Sourced from http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=10221 on 29 March 2018. NSW Government.

King Bluegrass – *Dichanthium queenslandicum*



King Bluegrass distributiuon map (DotEE, 2018d) Photo: AusGrass2, 2016b

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

King Bluegrass occurs only in Queensland where it occurs from the Darling Downs to around Hughenden. Three disjunct populations have been identified at Hughenden district; Nebo to Monto and west to Clermont and Rolleston; and around Dalby (DSEWPAC, 2013). DotEE (2018d) maps the species as potentially occurring in areas within 300km of the coast.

King Bluegrass occurs on heavy clay soils derived from a range of sources including alluvium and basalt. The species occurs in association with native grasslands and grassy woodlands, although it may also occur in disturbed or non-remnant habitats.

Records relevant to BGP

Bluegrass is known to occur in the BGP area, with robust populations recorded as the dominant species within some native grassland habitats and associated woodlands (RE 11.8.11 and RE 11.8.5) (Arrow Energy, 2014).

Presence of habitat within BGP area

The Queensland Government's potential habitat modelling for the species shows modelled potential habitat extending throughout large portions of the BGP area (Butler and Laidlaw, 2012c).

Core habitat for the species within the BGP has been mapped and is illustrated in the figure at Appendix D.3.

General threats

Threats to King Bluegrass include loss of habitat (through agricultural and mining activities, road construction and other infrastructure developments), cultivation for crop production, grazing and invasion from weeds such as Parthenium Weed and *Parkinsonia aculeata* (Parkinsonia)

(DSEWPAC, 2013).

BGP specific threats

Disturbance of up to a maximum of 1161.23 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377).

Without adequate mitigation measures in place, BGP activities would have the potential to remove and disturb additional habitat, introduce new weeds and increase weed frequency. They also have to potential to impact this species through soil compaction (to cracking clay soils) and mixing.

BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Habitat loss and disturbance

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that King Bluegrass habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)
- Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised

encroachment has occurred (B167)

- A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339)
- Any residual impacts to King Bluegrass (as confirmed by pre-clearance survey) will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Weeds

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through Project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180)
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)

Soil compaction and mixing

- Stripped and salvaged soil will be re-used within a short period of time in areas where rehabilitation immediately follows installation of low key infrastructures (B040)
- Topsoil and associated vegetation will be appropriately stockpiled separately for rehabilitation prior to excavation or earthworks (B042)
- Soil will be stripped according to designated profile depths, subject to further field investigations during stripping (B051)
- Where practicable, stripped material will be placed directly onto area to be rehabilitated and spread immediately (if rehabilitation sequences and weather conditions permit) to avoid the requirement for stockpiling (B052)
- Soils will be separated into windrows for later collection or re-spreading to minimise

compression effects of heavy equipment (B053)

- Soil transported by dump trucks may be placed directly into storage. Soil transported by scrapers will be pushed to form stockpiles by other equipment (e.g. dozer) to avoid tracking over previously laid soil to minimise compaction (B054)
- Surface of soil stockpiles will be left in as coarsely structured a condition as possible to promote infiltration and minimise erosion until vegetation is established or suitable erosion controls have been applied, and to prevent anaerobic zones from forming (B055)
- Pipeline construction will be conducted in a manner that limits the duration of exposure of soils. Stripped and salvaged soil will be re-used within a short period of time (i.e. 28 days) in areas where rehabilitation immediately follows the installation of pipelines (B063)
- Rehabilitation plans will be developed addressing ground preparation requirements, natural and constructed drainage patterns, soil erodibility, contamination, slope steepness and length, vegetation cover, land use and landowner requirements (B064)
- Topsoil will be stripped, salvaged and stockpiled separately from subsoils (B068)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- For areas mapped as core habitat for the King Bluegrass, the pre-clearance survey will include searches for individual plants
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting
- Pipeline RoWs will be routinely inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095)
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest

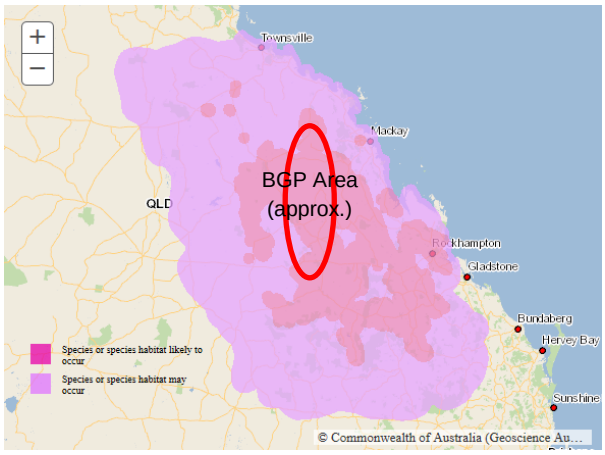
flora and evidence of pest fauna within Project disturbed areas (B171)

- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- Arrow Energy (2014). Supplementary Report to the Bowen Gas Project Environmental Impact Statement.
- AusGrass2 – Grasses of Australia (2016b). Online resource accessed via http://ausgrass2.myspecies.info/content/dichanthium-queenslandicum on 11 April 2018.
- Butler, D. and Laidlaw, M. (2012c). Potential habitat model for *Dichanthium queenslandicum*. Map date 31/08/2012. Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=11064 on 11 April 2018.
- DotEE (2014) Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018d). Species Profile and Threats Database – *Dichanthium queenslandicum* – King Blue-grass. SPRAT Profile. Sourced from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=5481 on 11 April 2018.
- DSEWPAC (2013). *Approved Conservation Advice for* Dichanthium queenslandicum. Canberra: Department of Sustainability, Environment, Water, Populations and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/5481-conservation-advice.pdf. In effect under the EPBC Act from 26-Feb-2013.

Ornamental Snake – *Denisonia maculata*



Ornamental Snake distribution map (DotEE, 2018e) Photo: Scott van Barneveld (Sourced from ALA, 2018)

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

The Ornamental Snake is endemic to central Queensland where it is known from south of Townsville in the north to around Moura in the south. Shoalwater Bay near Rockhampton in the north to near Ulladulla in the south. It has been recorded up to 300km from the coast.

Feeding almost exclusively on frogs, Ornamental Snake occur on floodplains, undulating clay pans (including gilgai formations), wetlands and watercourses (DoE, 2014).

Records relevant to BGP

The Ornamental Snake was recorded at one location to the south-east of Moranbah during the field surveys for the EIS (Arrow, 2014). This individual was recorded within a *Eucalyptus coolabah* (Coolabah) woodland with shallow gilgai development and groundcover dominated by *Eleocharis pallens* (Pale Spike-rush).

Numerous specimens have previously been recorded within and in close proximity to the BGP area. In addition to widespread scattered records, large numbers were captured within open trenches associated with the construction of the Moranbah Gas Pipeline in 2004 and the Burdekin – Moranbah Gas Pipeline in 2006 (Qld Govt, 2018b). These records indicate that the Ornamental Snake occurs in both remnant and cleared (non-remnant) areas within the tenements.

Presence of habitat within BGP area

DotEE (2018e) shows that the BGP area is located within the central area of likely habitat. Likewise, the Queensland Government's potential habitat modelling for the species shows the modelled potential habitat extending across the BGP area (Butler and Laidlaw, 2012d).

Core habitat for the species within the BGP has been mapped and is illustrated in the figure at

Appendix D.4.

General threats

Habitat loss and degradation, destruction of wetlands and frog habitats (including by pigs) and poisoning by cane toads are identified threats (WWF-Australia/QMDC as cited in DoE, 2014).

BGP specific threats

Disturbance of up to a maximum of 1030.31 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377).

Without adequate mitigation measures in place, BGP activities would have the potential to remove and disturb additional habitat (including wetlands), increase abundance of pigs and cane toads and directly cause fatalities and injuries to individuals including through entrapment in open trenches and during dam construction.

BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Habitat loss and degradation, including destruction of wetlands and frog habitats

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that Ornamental Snake habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)
- Sensitive infrastructure design principles will be applied to avoid watercourse, drainage lines and riparian areas where practicable (B142)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods

(e.g., narrowing of RoW) are being implemented, where required (B182)

- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Erosion and Sediment Control Plans will be developed and maintained in accordance with the International Erosion Control Association (IECA) (2008) Best Practice Erosion and Sediment Control guidelines. All proposed erosion and sediment control measures will be implemented in advance of, or in conjunction with clearing activities (B066)
- Watercourse crossings will be minimised, where practicable, during route selection. Where required, crossing locations will be selected to avoid or minimise disturbance to aquatic flora, waterholes, watercourse junctions and watercourses with steep banks (B220)
- Watercourse crossings will be constructed in a manner that minimises sediment release to watercourses, stream bed scouring, obstruction of water flows and disturbance of stream banks and riparian vegetation (i.e., the crossing location will be at a point of low velocity, and straight sections will be targeted, with the pipeline or road orientated as near to perpendicular to water flow as practicable) (B221)
- Gathering lines and tracks will be designed to avoid watercourses, drainage lines and riparian areas (particularly permanent watercourses or perennial aquatic habitat), where practicable (B227)
- Any residual impacts to Ornamental Snake Core Habitat will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts

Pig and cane toad abundance

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- In accordance with the Pest Management Plan routine inspections for pest flora and evidence of pest fauna will be undertaken within Project disturbed areas (B171)

Direct injury or mortality including through entrapment in open trenches and during dam construction

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Where practicable, disturbance will be avoided in areas known or assessed to be suitable habitat during the breeding season (September to April)

- Where practicable, if breeding activity is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated
- Soil cracks within potential habitat that could harbour snakes will be marked with spray paint. A borescope, or similar equipment, will be used to determine the presence of a snake. If a snake is found, the spotter-catcher will attempt to dig up the soil crack and remove the animal
- Spotlighting will be completed in line with Arrow's Ornamental Snake Guideline (ORG-ARW-HSM-GUI-00101, Section 8) when the following are met:
  - Prior to commencing construction activities that involve significant ground disturbance; and
  - Within the breeding and high activity period of September to April
- Snakes captured will be retained by a licensed spotter-catcher for the duration of the day's construction activities and released in a suitable habitat in close proximity to the site boundaries that evening (i.e. within 24 hours), or retained and released in line with the spotter-catcher's permits if construction is ongoing
- Speed limits will be developed for Project controlled roads with due consideration to reduce the potential for vehicle collisions with wildlife (B154)
- Trenches will be inspected and monitored as per the APIA Code of Environmental Practice (B159) and will be checked within two hours of sunrise and trapped fauna released. Additional monitoring will be undertaken following rainfall events
- Minimise the time a trench is left open. Construct exit points when construction is within 1 km of native vegetation, using appropriate material. Provide fauna refuges, such as sawdust-filled bags, regularly through areas of high fauna activity (B173)
- Harm to fauna from entrapment during construction and operation of dams will be prevented-(B184)
- During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186)
- As soon as practical following pipe laying, the trench will be backfilled with excavated material, compacted and topsoil replaced and erosion controls implemented (B299)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)

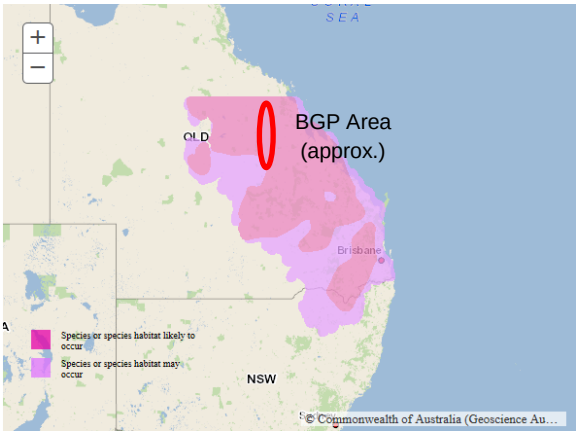
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported

- Ornamental Snake Guideline (ORG-ARW-HSM-GUI-00101) – this document sets out, among other things, how pre-clearance surveys will include active searches to confirm presence of microhabitat features including gilgai, soil cracks and ground litter and spotlighting in areas mapped as core habitat
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting
- Trenches will be inspected and monitored as per the APIA Code of Environmental Practice (B159) and will be checked within two hours of sunrise and trapped fauna released. Additional monitoring will be undertaken following rainfall events
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Consideration will be given to conducting targeted monitoring in co-operation with the proponents of overlapping Projects. Particularly suited species to such monitoring include Ornamental Snake and Koala (B165)
- All human/wildlife interactions or incidents involving EVNT Act fauna species will be reported to Arrow via the Fauna Incident Notification Form (FIN) within 24 hours, and will be detailed in the FSC report to be provided to Arrow at the completion of habitat clearing activities (or weekly if clearing activities are ongoing). The FSC report will also detail all human/wildlife interactions or incidents with any species irrespective of their conservation status. Interactions are defined as observations of the species on the work site, captures, removals and relocations. Incidents are defined as any injury or death.
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)

- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- ALA (2018a). *Denisonia maculata* (Steindachner, 1867) Ornamental Snake. Sourced from Altas of Living Australia at: https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:1a330354-5599-4646-94e2-057a1b4422dc on 11 April 2018.
- Butler, D. and Laidlaw, M. (2012d). Potential habitat model for *Denisonia maculata* ornamental snake. Map date 30/08/2012. Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=483# on 11 April 2018.
- DoE (2014). *Approved Conservation Advice for* Denisonia maculata *(Ornamental Snake)*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1193-conservation-advice.pdf. In effect under the EPBC Act from 29-Apr-2014.
- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018e). Species Profile and Threats Database – *Denisonia maculata* – Ornamental Snake. SPRAT Profile. Sourced from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193 on 11 April 2018.
- Qld Govt (2018b). Sighting data associated with the Species profile – *Denisonia maculata* (Elapidae) sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=483# on 11 April 2018.

Squatter Pigeon – *Geophaps scripta scripta*	
	
Squatter pigeon distributiuon map (DotEE, 2018f)	Photo: Steven Dew; sourced from ALA, 2018b.

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

The distribution of Squatter Pigeon extends from Collinsville in the north south into northern NSW and from the coast to as far west as Longreach and Charleville (TSSC, 2015a). It is rarer in the southern portions of this range.

It is principally associated with open eucalypt woodlands with a grassy understorey and savannahs, usually near permanent water (including dams) (TSSC, 2015a).

Records relevant to BGP

Records of Squatter Pigeon are widespread in close proximity to the BGP area and include 10 records within the BGP area itself (Qld Govt, 2018c).

Presence of habitat within BGP area

DotEE (2018f) shows that the BGP area lies within likely habitat areas and the Queensland Government's potential habitat modelling for the species shows modelled Squatter Pigeon habitat throughout large portions of the BGP area (Butler and Laidlaw, 2012e).

Core habitat for the species within the BGP has been mapped and is illustrated in the figure at Appendix D.5.

General threats

Identified threats include habitat loss and fragmentation, overgrazing by livestock and rabbits, weeds, inappropriate fire regimes, predation by feral cats and foxes and illegal shooting (Garnett and Crowley, 2000 and Stewart, pers. comm. as cited in TSSC, 2015a).

BGP specific threats

Disturbance of up to a maximum of 1,415.44 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377).

Without adequate mitigation measures in place, BGP activities would have the potential to remove, fragment and disturb additional habitat, contribute to increased abundance of rabbits, feral cats, foxes or weeds and contribute to altered fire regimes or increased illegal shooting. They also have the potential to cause direct injury or mortality.

BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Habitat loss, fragmentation and disturbance

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that Squatter Pigeon habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)
- Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Habitat trees will be retained where practicable (B137)
- Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)
- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Delineation of disturbance boundary limits of works will be clearly established prior to

commencement of clearing and soil stripping (B049)

- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Any residual impacts to Squatter Pigeon Core Habitat will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Increased abundance of rabbits, feral cats, foxes and weeds

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180)
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480)
- Radiation exclusion zones around flares will be designed according to API standard (B485)

- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)
- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns, will be developed (B533)
- Regular patrols and inspections of pipeline easements will be conducted, including assessment of the status of signposting subsidence and of fire breaks (B536)
- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Illegal shooting

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)

Direct injury or mortality

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Where practicable, disturbance will be avoided in areas known or assessed to be suitable habitat during breeding season (varies, mostly early dry season)
- Checks for identified potential breeding places will be undertaken immediately prior to

commencing vegetation clearing

- Where practicable, if breeding activity is observed, an exclusion zone (50 m radius) will be enforced until the breeding place is vacated
- Removal or relocation of individuals, young or eggs will only be undertaken where all practicable measures have been taken to avoid and minimise impacts on the identified active breeding place
- As a last resort, eggs or young may be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release
- Speed limits will be developed for Project controlled roads with due consideration to reduce the potential for vehicle collisions with wildlife (B154)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- For areas mapped as core habitat for the Squatter Pigeon, the pre-clearance survey will include searches for individual birds
- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- The coordinates and total area of cleared habitat will be recorded and tracked monthly

against approved maximum disturbance limits and used for annual compliance reporting

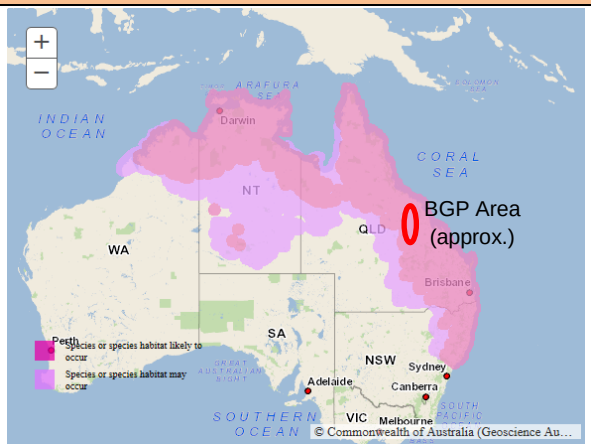
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- ALA (2018b). Geophaps (Geophaps) scripta scripta (Temminck, 1821). Sourced from Altas of Living Australia at: https://bie.ala.org.au/species/urn:lsid:biodiversity.org.au:afd.taxon:d5c52cd0-6d21-4322-a5c5-bc11a94d8c3a on 11 April 2018.
- Butler, D. and Laidlaw, M. (2012e). Potential habitat model for *Geophaps scripta scripta* squatter pigeon. Map date 30/08/2012. Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=1785# on 11 April 2018.
- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018f). Species Profile and Threats Database – *Geophaps scripta scripta* – Squatter Pigeon. SPRAT Profile. Sourced from: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64440 on 11 April 2018.
- Qld Govt (2018c). Sighting data associated with the Species profile – *Geophaps scripta scripta* (Columbidae) sourced from: https://environment.ehp.qld.gov.au/species-search/details/?id=1785# on 11 April 2018.
- TSSC (2015a). Threatened Species Scientific Committee (2015). *Conservation Advice*

Geophaps scripta scripta *squatter pigeon (southern)*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64440-conservation-advice-31102015.pdf. In effect under the EPBC Act from 27-Oct-2015.

Red Goshawk – *Erythrotriorchis radiatus*



Red Goshawk distributiuon map (DotEE, 2018g)

Photo: Hansch, R. (Sourced from IBC, 2018)

Status

Vulnerable (EPBC Act); Endangered (Qld Nature Conservation Act)

Distribution and Habitat

Red Goshawk is believed to be patchily distributed in coastal and sub-coastal regions of northern and eastern Australia although there are less recent records in southern portions of its range (TSSC, 2015b).

In central Queensland it is known to occupies tall open forests and woodlands and the edges of rainforests, and is associated with gorge and escarpment country (Czechura and Hobson, 2000 and Czechura *et al*., 2009 as cited in TSSC, 2015b). The species hunts within a home range of up to 200km^2 but rarely breeds in areas with fragmented native vegetation (TSSC, 2015b).

Red Goshawk prefers forest and woodland with a mosaic of vegetation types, large prey populations (birds), and permanent water. The vegetation types include eucalypt woodland, open forest, tall open forest, gallery rainforest, swamp sclerophyll forest and rainforest margins.

Records relevant to BGP

The species was not recorded during the EIS studies but Qld Govt (2018g) has three records in close proximity to northern portions of the BGP area. The latest of these records is from 2013.

Presence of habitat within BGP area

DotEE (2018g) shows that the BGP area is within likely habitat. The Queensland Government's potential habitat modelling for the species shows the modelled potential habitat generally lies to the east of the eastern edge of the BGP area (Butler and Laidlaw, 2012d).

Core habitat for the species within the BGP has been mapped and is illustrated in the figure at Appendix D.6.

General threats
Vegetation clearing, habitat fragmentation and degradation (including loss of wetlands and hollow-bearing tree (where prey breed) and through overgrazing by livestock and feral herbivores and altered fire regimes) are identified threats or potential threats (TSSC, 2015b).
BGP specific threats
Disturbance of up to a maximum of 187.14 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377). Without adequate mitigation measures in place, BGP activities would have the potential to remove, fragment and disturb additional habitat and contribute to increased feral herbivore numbers (e.g. rabbits) and altered fire frequency. They also have the potential to cause direct injury or mortality.
BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)
Habitat loss, fragmentation and disturbance • When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that Red Goshawk habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked • Disturbance within core habitat for EVNT species will be avoided where possible (B131) • Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132) • Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134) • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135) • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136) • Habitat trees will be retained where practicable (B137) • Removing riparian vegetation will be avoided when directional drilling and right of ways will be reduced where practical (B138) • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)

- Sensitive infrastructure design principles will be applied to avoid watercourse, drainage lines and riparian areas where practicable (B142)
- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Lighting will be designed in a manner that limits disruption on landscape character, views and visual amenity and direct lighting into the infrastructure siting rather than dispersed into native vegetation when sites are adjacent to intact habitat (B099)
- Any residual impacts to Red Goshawk (as confirmed by pre-clearance and spotter-catcher surveys) will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Increased feral herbivore numbers

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- In accordance with the Pest Management Plan routine inspections for pest flora and evidence of pest fauna will be undertaken within Project disturbed areas (B171)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480)

- Radiation exclusion zones around flares will be designed according to API standard (B485)
- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)
- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns, will be developed (B533)
- Regular patrols and inspections of pipeline easements will be conducted, including assessment of the status of signposting subsidence and of fire breaks (B536)
- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Direct injury or mortality

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- The probability of Red Goshawk nesting in the BGP is considered low. However, should a potential nest be identified in proximity to existing or proposed project activities the Construction Contractor would be require, as a minimum, to:
  - Stop work at the location
  - Notify Arrow so that Arrow may notify the relevant authorities (i.e. DotEE and DES)
  - Seek approval from DotEE for additional disturbance if any impact is ‘significant’ and unavoidable

- Manage the species or community in accordance with the mitigation measures listed and all applicable conditions of approval including the Offset Strategy for the relevant Project Phase
- Tag/barricade the identified species/community in an appropriate manner to ensure protection
- Cease clearing works in the immediate area
- Record GPS coordinates so that it may be incorporated into the Site Environmental Map as a 'no-go zone' or recorded as an impact area
- Provide all relevant information to Arrow for monthly tracking of EPBC Act species and community impacts for annual reporting

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- For areas mapped as core habitat for the Red Goshawk, the pre-clearance survey will include searches for individual birds
- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- The coordinates and total area of cleared habitat will be recorded and tracked monthly

against approved maximum disturbance limits and used for annual compliance reporting

- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- Butler, D. and Laidlaw, M. (2012f). Potential habitat model for *Erythrotriorchis radiatus* red goshawk. Map date 30/08/2012. Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=1728# on 26 March 2018.
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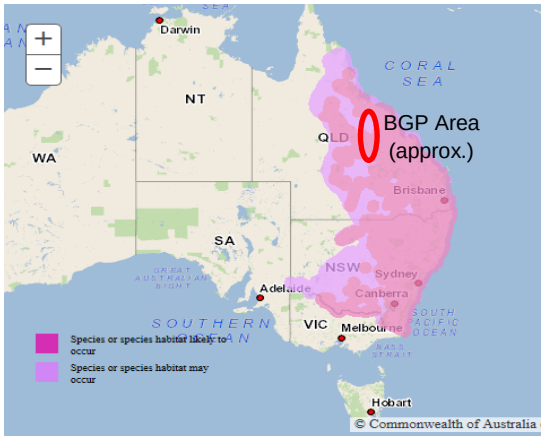
- Qld Govt (2018d). Sighting data associated with the Species profile – *Erythrotriorchis radiatus* (Accipitridae) sourced from: https://environment.ehp.qld.gov.au/species-search/details/?id=1728# on 11 April 2018.
- TSSC (2015b). *Conservation Advice* Erythrotriorchis radiatus *red goshawk*. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/942-conservation-advice-31102015.pdf. In effect under the EPBC Act from 27-Oct-2015.

Koala – *Phascolarctos cinereus*



Koala distribution map (DotEE, 2018h)

Photo: Herald Sun

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

Endemic to eastern Australia, the Koala is a solitary species that is widespread across coastal and inland areas from Cooktown, Queensland to the Mt. Lofty ranges, South Australia (Martin *et al*., 2008). It is restricted to altitudes below 800m elevation (Munks *et al*., 1996).

Koalas occur in a diversity of habitats including temperate, sub-tropical and tropical forest, woodland and semi-arid communities, and sclerophyll forest, on foothills, plains and in coastal areas (Martin and Handasyde, 1999; Martin *et al*., 2008). Koalas on the western side of the Great Dividing Range at the western edges of their range are often associated with watercourses though are not restricted to them (Melzer *et al*., 2000; Sullivan et al. 2003). Favoured feed tree species in these areas include *Eucalyptus camaldulensis* (River Red Gum), Coolabah and *E. populnea* (Poplar Box).

In the western extent of their range, including the project area, Koalas inhabit Eucalypt-dominated forests and woodlands, particularly in the vicinity of riparian environments, and Acacia-dominated forests, woodlands and shrublands, Arrow (2014).

Records relevant to the BGP

In comparison to coastal districts, the Koala population density is low within the BGP area and the wider Bowen Basin. There are a relatively small number of sightings in the BGP area within the Qld Govt (2018d) records database.

Presence of habitat within BGP area

DotEE (2018h) shows that the BGP area is within likely habitat. DotEE (2018h) shows that the BGP area is within likely habitat. Core habitat for the species within the BGP has been mapped and is

illustrated in the figure at Appendix D.7.
General threats
Habitat loss and fragmentation, vehicle strike, disease, and predation by dogs (DSEWPAC, 2012a).
SGP specific threats
Disturbance of up to a maximum of 2,466.04 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377). Without adequate mitigation measures in place, BGP activities would have the potential to remove, and fragment additional habitat and contribute to increased injury and mortality including through vehicle strike, increased incidence of disease and predation by dogs.
SGP specific mitigation measures (Arrow SGP SREIS 2013 – commitment number in parenthesis)
Habitat loss and fragmentation • When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that Koala habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked • Disturbance within core habitat for EVNT species will be avoided where possible (B131) • Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132) • Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134) • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135) • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136) • Habitat trees will be retained where practicable (B137) • Trees will be felled away from existing vegetation not identified for removal where practicable (B150) • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140) • Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)

- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339)
- Lighting will be designed in a manner that limits disruption on landscape character, views and visual amenity and direct lighting into the infrastructure siting rather than dispersed into native vegetation when sites are adjacent to intact habitat (B099)
- Any residual impacts to Koala Core Habitat (as confirmed by pre-clearance survey) will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Direct injury or mortality

- Where practicable, avoid disturbance in areas known or assessed to be suitable habitat during breeding season (October to May)
- Key Koala trees will be identified and visually inspect prior to clearing to ensure that they are free of Koalas. If Koalas are located, the tree will be retained until the animals have moved on, typically overnight (B190)
- If a Koala is found within the clearing footprint; a minimum exclusion zone of 100 m will be established for a female Koala with obvious young and 50 m for all other Koala, until the animal has moved of its own accord. No vehicles are to enter the buffer (exclusion) zone at any time. Vehicle operators will be made aware of the presence of the Koala and a reduced speed limit established until the animal has moved on of its own accord
- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Speed limits will be developed for Project controlled roads with due consideration to reduce the potential for vehicle collisions with wildlife (B154)
- Trenches will be inspected and monitored as per the APIA Code of Environmental Practice (B159) and will be checked within two hours of sunrise and trapped fauna released. Additional monitoring will be undertaken following rainfall events
- Minimise the time a trench is left open. Construct exit points when construction is within 1 km of native vegetation, using appropriate material. Provide fauna refuges, such as sawdust-filled bags, regularly through areas of high fauna activity (B173)

- Harm to fauna from entrapment during construction and operation of dams will be prevented- (B184)
- As soon as practical following pipe laying, the trench will be backfilled with excavated material, compacted and topsoil replaced and erosion controls implemented (B299)
- During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186)

Disease

- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time

Predation by dogs

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- In accordance with the Pest Management Plan routine inspections for pest flora and evidence of pest fauna will be undertaken within Project disturbed areas (B171)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy

addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas

- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSC on site at the time of clearing will depend on the number of machines being used at any given time
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Key Koala trees will be identified and visually inspect prior to clearing to ensure that they are free of Koalas. If Koalas are located, the tree will be retained until the animals have moved on, typically overnight (B190)
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting.
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Targeted monitoring effort conducted in co-operation with the proponents of overlapping Projects will be considered. Particularly suited species to such monitoring include Ornamental Snake and Koala (B165)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- Arrow Energy (2014). Supplementary Report to the Bowen Gas Project Environmental Impact Statement.
- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October

2014.

- DotEE (2018h). Species Profile and Threats Database – *Phascolarctos cinereus* (combined populations of Qld, NSW and the ACT) - Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) SPRAT Profile. Sourced from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=85104 on 12 April 2018.
- DSEWPAC (2012a). *Approved Conservation Advice for* Phascolarctos cinereus *(combined populations in Queensland, New South Wales and the Australian Capital Territory)*. Canberra: Department of Sustainability, Environment, Water, Population and Communities. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/197-conservation-advice.pdf. In effect under the EPBC Act from 02-May-2012.
- Martin, R., Handasyde, K. (1999). The Koala: Natural history, conservation and management. Sydney, NSW: UNSW Press.
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- Munks, S.A., Corkrey, R., Foley, W.J. (1996). Characteristics of arboreal marsupial habitat in the semi-arid woodlands of northern Queensland. Wildlife Research 23. 185-195.
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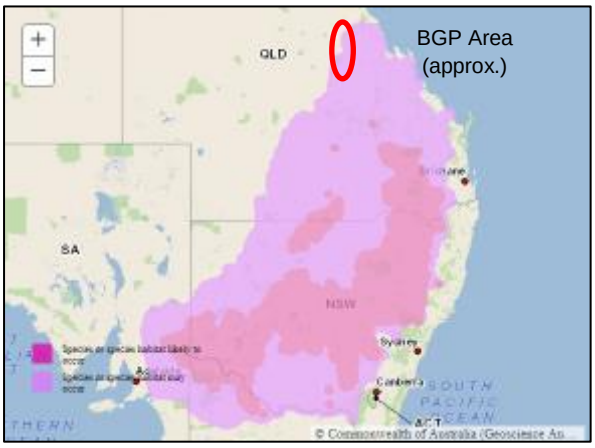
- Sullivan, B.J., Baxter, G.S., Lisle, A.T. (2003). Low-density Koala (Phascolarctos cinereus) populations in the mulgalands of south-west Queensland. III. Broad-scale patterns of habitat use. Wildlife Research 30. 583-591.

South-eastern Long-eared Bat – *Nyctophilus corbeni*



N. corbeni distributiuon map (DotEE, 2018i)

Photo: Leard Frontline Action

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

Nyctophilus corbeni is largely restricted to the Murray-Darling Basin (Churchill, 2008), with its stronghold in the Pilliga forests of central New South Wales (Turbill and Ellis, 2006). In Queensland, the species is mainly recorded in the southern areas of the Brigalow Belt (Reardon, 2012). The distributional limits in Queensland are uncertain. McFarland and others (1999) state that the species is found north to near Duaringa, and Venz *et. al*. (2002) consider that the Dawson River area is at, or close to, its northern range limit. However, Parnaby (2009), in a taxonomic review of Australian greater long-eared bats previously known as *N. timoriensis*, states that the most northerly record of the species is from 80km west of Taroom. It is unknown if possible misidentifications of the species have resulted in the uncertainty attached to its distribution.

The Queensland Government's potential habitat modelling for the species shows all modelled potential habitat being south of the BGP area (Butler and Laidlaw, 2012g).

The species is most common in box/ironbark/cypress pine woodland on sandy soils (Turbill and Ellis, 2006; Churchill, 2008; Turbill *et al*., 2008), though it also occurs in *Allocasuarina luehmannii* (Bulloak), Brigalow and *Casuarina cristata* (Belah) communities (Turbill *et al*., 2008), dry sclerophyll forests with *Corymbia citriodora*, and semi-evergreen vine thickets. The species prefers areas with a distinct canopy and a dense understorey (Churchill, 2008). Most records are from large tracts of vegetation, approximately 5,000+ ha in size (e.g. Southwood National Park) (EPA, 2008), although the species can be occasionally recorded from smaller vegetation tracts of 600 ha (e.g. Erringibba National Park). Field observations and published literature also suggests it may use riparian habitats, though these habitats may be more important for providing roosting sites (hollow-bearing trees) and water.

Records relevant to BGP
The South-eastern Long-eared Bat was not recorded during the recent detailed surveys within the BGP area or during previous EIS ecological studies. The nearest reliable record is approximately 170km south of the BGP area (Butler and Laidlaw, 2012g and Qld Govt, 2018f).
Presence of habitat within BGP area
DotEE (2018i) shows potential habitat as possibly extending as far north as the BGP area and Core habitat for the species within the BGP has been mapped and is illustrated in the figure at Appendix D.8. However it is considered that there is a low likelihood that the South-eastern Long-eared Bat actually occurs in the area given: • the absence of records during the BGP EIS and subsequent detailed assessments with the area • lack of records of this species within 170km the BGP area (Qld Govt,2018f), and • the Queensland Government's potential habitat modelling showing all habitat as being to the south of the BGP area (Butler and Laidlaw, 2012g). As such, the results of ongoing pre-clearance surveys, spotter-catcher findings and monitoring results will be taken into account in confirming and calculating actual areas of impact to core habitat within the BGP area (if any).
General threats
Habitat loss and fragmentation, fire, reduction in hollow availability, exposure to agrichemicals, grazing and predation by feral animals (TSSC, 2015).
BGP specific threats
Disturbance of up to a maximum of 2,282.57 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377). This area was based on the area of Regional Ecosystems that were identified by the EIS as having suitable structural characteristics to support the species. However, impacts upon habitat actually supporting the species (if any) are likely to be much less and will be confirmed and quantified by preclearance survey. BGP activities will require clearing of hollow-bearing trees and, in the absence of appropriate mitigation measures, would also have the potential to fragment habitat, contribute to changed fire frequency and pest animal populations and increase exposure to agrichemicals. They also have the potential to cause direct injury or mortality.
BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)
Habitat loss, fragmentation and reduction of hollow availability • When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step

will be recorded within Geocortex and the Arrow Sharepoint database

- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that impacts to *N. corbeni* habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)
- Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Habitat trees will be retained where practicable (B137)
- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Trees will be assessed for potential nesting hollows prior to felling. If hollows are identified, trees will be felled in the presence of a qualified FSC and rolled so that the hollows are facing upwards, allowing fauna to escape (B189)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Lighting will be designed in a manner that limits disruption on landscape character, views and visual amenity and direct lighting into the infrastructure siting rather than dispersed into native vegetation when sites are adjacent to intact habitat (B099)
- Any residual impacts to South-eastern Long-eared Bat Core Habitat (as confirmed by pre-clearance survey) will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480)
- Radiation exclusion zones around flares will be designed according to API standard (B485)
- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)
- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns, will be developed (B533)
- Regular patrols and inspections of pipeline easements will be conducted, including assessment of the status of signposting subsidence and of fire breaks (B536)
- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Exposure to agrichemicals

- Appropriate international, Australian and industry standards and codes of practice will be applied for the handling of hazardous materials, such as chemicals, fuels and lubricants (B078)

- Staff training will be provided on appropriate handling, storage and containment practices for chemical, fuels and other potential chemicals as relevant (B083)

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Predation by feral animals

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- In accordance with the Pest Management Plan routine inspections for pest flora and evidence of pest fauna will be undertaken within Project disturbed areas (B171)

Direct injury or mortality

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Potential breeding places will be clearly marked in the field with spray paint, coloured flagging tape (unless not permitted by land owners, e.g. some cattle properties), or by other suitable methods
- Further checks of identified potential nests will be undertaken immediately prior to commencing vegetation clearing
- All reasonable and practicable attempts (if safe to do so) will be made to check hollow bearing trees, hollow logs, peeling bark and splits in tree trunks for the presence of this species
- Where practicable, if breeding activity is observed, an exclusion zone (30 m radius) will be enforced until the breeding place is vacated
- As a last resort, young may be removed and placed with a licensed wildlife carer/facility for incubation of eggs and/or raising of the young for subsequent release
- Where hollows containing microbat maternity sites have been identified that are inactive and unavoidable, the FSC is to determine whether it is to be relocated or left in situ
- Where relocation of animals in tree hollows is required, an elevated work platform or cherry-picker may be used in conjunction with a chainsaw operator and the FSC (or a FSC who holds a current training qualification in use of chainsaws) to attempt to remove the hollow. The following step-by-step process (modified from Nottidge, 2012) will be considered if safe to do so:
    - The FSC (with chainsaw operator unless the FSC is a qualified chainsaw operator) will inspect each visible hollow or potential breeding place (e.g. nest) identified in each tree

using the cherry picker. This is usually carried out by simply looking into hollows and nests (with the assistance of a small torch); however, fibrescopes may also be useful for deep hollows

- If bats are located within a hollow, a piece of towel or rag would be firmly placed in the entrance to prevent the wildlife from escaping, as they may attempt to flee the nesting/denning hollow
- Once the hollow entrance has been secured, the chainsaw operator will remove the entire hollow limb below the cavity where the branch remains solid. In circumstances where a hollow continues into the main stem of the tree, the chainsaw operator would carefully cut a small window into the hollow, allowing the FSC to plug the hollow above and below the window, then the hollow limb is removed and lowered to the ground in sections
- When the bats have been safely secured within its hollow, the entire limb would then be placed in the cherry-picker bucket or lowered to the ground using ropes (depending on the size of the limb)
- This limb would be placed in a cool, quiet location until translocation to the recipient habitat site, when at dusk of the same day the hollow entrance will be re-opened to allow the bats to emerge of their own accord

- Speed limits will be developed for Project controlled roads with due consideration to reduce the potential for vehicle collisions with wildlife (B154)
- During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported

- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- For areas mapped as core habitat for the South-eastern Long-eared Bat, the pre-clearance survey will include observations of hollow-bearing tree branches and patches of vegetation with a distinct canopy and a dense cluttered shrub layer (i.e. habitat in which this species is most abundant; DEHP 2013)
- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Based on the detection of any South-eastern Long-eared Bats in the locality of proposed works or adjoining areas (rather than solely on the basis of potential core habitat areas (as mapped in the EIS), the coordinates and total area of cleared their habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

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long-eared bat. Map date 30/08/2012. Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=939 on 27 March 2018.

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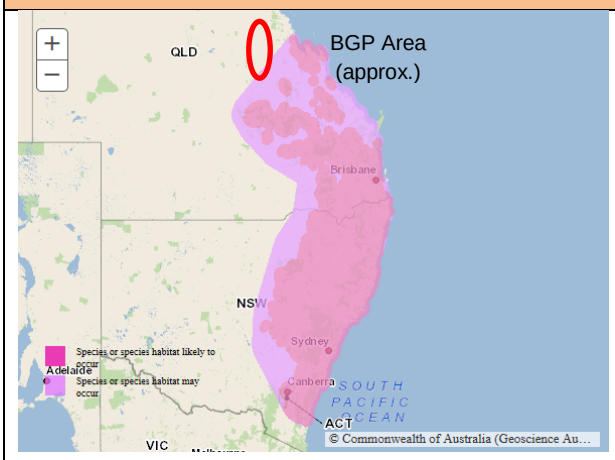
Large-eared Pied Bat – *Chalinolobus dwyeri*



C.dwyeri distributiuon map (DotEE, 2018j) Photo: Hogan, L., Queensland Herbarium, DSITIA, 2001

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

The current distribution of *Chalinolobus dwyeri* is poorly known with records from Shoalwater Bay near Rockhampton in the north to near Ulladulla in the south (TSSC, 2010). Much of the known distribution is in NSW (EPA, 2007 as cited in TSSC, 2010), however, the species has also been record in Queensland from the Blackdown Tablelands, the Carnarvon and the Expedition Ranges and south to the border at Wilson's Peak and Girraween. Hoye (2005), as cited in TSSC (2010) surmises that the populations in north-eastern New South Wales and south-east Queensland, Shoalwater Bay and Blackdown Tablelands are likely to be isolated with little interaction with other populations.

The Queensland Government's potential habitat modelling for the species shows all modelled potential habitat extends southwards from the southern tip of the BGP area on the Blackdown Tablelands or is well to the east (Butler and Laidlaw, 2012h). However, Fly by Night Surveys Pty Ltd (2005), as cited in DERM (2011), identify areas north or the Blackdown Tablelands as "potential areas of occurrence requiring further investigation".

The species requires a combination of sandstone cliff/escarpment with suitable caves to provide roosting habitat that is adjacent to higher fertility sites particularly box gum woodlands or river/rainforest corridors which are used for foraging (Pennay, pers. comm. as cited in TSSC, 2010). Most records are within several kilometres of cliffs or rocky terrain (DERM, 2011).

Nursery roosts structure appears to be specific (including requirements for arch caves od adequate depth with indented dome roofs) and these physical requirements are a limiting factor. Connectivity between roost sites and remnant vegetation is likely to be an important factor (DECC, 2007; Pennay, 2008; Pennay, pers. comm. as cited in TSSC, 2010). The majority of records are from canopied habitat, suggesting a sensitivity to clearing, although narrow connecting riparian strips in otherwise cleared habitat are sometimes quite heavily used (DECC 2007, as cited in DERM, 2011).

Records relevant to BGP
The Large-eared Pied Bat was not recorded during the recent detailed surveys within the BGP area or during previous EIS ecological studies. There is one record from the Blackdown Tablelands near the southern boundary of the BGP area (Butler and Laidlaw, 2012h and Qld Govt, 2018g).
Presence of habitat within BGP area
DotEE (2018j) shows potential habitat as possibly extending as far north as the south-eastern corner of the BGP area and Fly by Night Surveys Pty Ltd (2005), as cited in DERM (2011), identify areas north or the Blackdown Tablelands as "potential areas of occurrence requiring further investigation". As such, Core habitat for the species within the BGP has been mapped and is illustrated in the figure at Appendix D.9. However it is considered that there is a low likelihood that the Large-eared Pied Bat actually occurs in all but the extreme south-eastern corner of the tenement (the Blackdown Tableland plateau extends 3km into the tenement). The likelihood beyond this corner is considered low based on: • the absence of records during the BGP EIS and subsequent detailed assessments with the area • lack of records of this species the BGP area (Qld Govt,2018g) • the species highly specific habitat requirements (i.e. proximity to arch caves of adequate depth), and • the Queensland Government's potential habitat modelling showing all habitat as being to the south or further east of the BGP area (Butler and Laidlaw, 2012h). As such, the results of ongoing pre-clearance surveys, spotter-catcher findings and monitoring results will be taken into account in confirming and calculating actual areas of impact to core habitat within the BGP area (if any).
General threats
Disturbance and damage at primary nursery roosts by animals and humans (recreational activities associated with cliffs), loss of foraging habitat (which must be adjacent to roosting sites) and predation by foxes and other predators (DERM 2011 and Pennay, pers comm. as cited in TSSC, 2010).
BGP specific threats
Disturbance of up to a maximum of 1,451.44 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377). This area was based on the area of Regional Ecosystems that were identified by the EIS as having suitable structural characteristics to support the species. However, impacts upon habitat actually supporting the species (if any) are likely to be much less and will be confirmed and quantified by preclearance survey. BGP activities will avoid suitable roosting caves but, in the absence of appropriate management measures, have the potential to disturb and fragment adjacent foraging habitat and contribute to changes in pest animal population characteristics. They also have the potential to cause direct injury or mortality.

BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Habitat loss, fragmentation and disturbance

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that any occupied roosting caves are present these will be excluded from the developable footprint and buffered (buffer distance to be determined by an suitably qualified person to ensure no disturbance of bats) Impacts to *C. dwyeri* foraging habitat (habitat that is contiguous with occupied roosts) cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)
- Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Habitat trees will be retained where practicable (B137)
- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Lighting will be designed in a manner that limits disruption on landscape character, views

and visual amenity and direct lighting into the infrastructure siting rather than dispersed into native vegetation when sites are adjacent to intact habitat (B099)

- Any residual impacts to Large-eared Pied Bat Core Habitat (as confirmed by pre-clearance survey) will be offset A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Predation by foxes and other predators

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- In accordance with the Pest Management Plan routine inspections for pest flora and evidence of pest fauna will be undertaken within Project disturbed areas (B171)

Disturbance and damage to primary nursery roosts by animals and humans

- As per the above two dot points a declared weed and pest management plan will be developed and implemented for the Project which will addressing pest animal management (B171 and B191)
- Noise control techniques will be implemented in accordance with the noise and vibration commitments and standard industry noise suppression techniques (B146)
- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)

Direct injury or mortality

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- All reasonable and practicable attempts (if safe to do so) will be made to check suitable caves for the presence of this species
- Potential breeding places will be clearly marked in the field with spray paint, coloured flagging tape (unless not permitted by land owners, e.g. some cattle properties), or by other suitable methods
- Further checks of identified potential nests will be undertaken immediately prior to commencing vegetation clearing
- Speed limits will be developed for Project controlled roads with due consideration to reduce the potential for vehicle collisions with wildlife (B154)
- During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- For areas mapped as core habitat for the Large-eared Pied Bat, the pre-clearance survey will include observations for arch caves of adequate depth and adjoining patches of vegetation
- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Based on the detection of any Large-eared Pied Bats in the locality of proposed works or adjoining areas (rather than solely on the basis of potential core habitat areas (as mapped in the EIS), the coordinates and total area of cleared their habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest

flora and evidence of pest fauna within Project disturbed areas (B171)

- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- Butler, D. and Laidlaw, M. (2012h). Potential habitat model for *Chalinolobus dwyeri* large-eared pied bat. Map date 30/08/2012. Queensland Department of Science, Information Technology, Innovation and the Arts (DSITIA). Sourced from https://environment.ehp.qld.gov.au/species-search/details/?id=971# on 26 March 2018.
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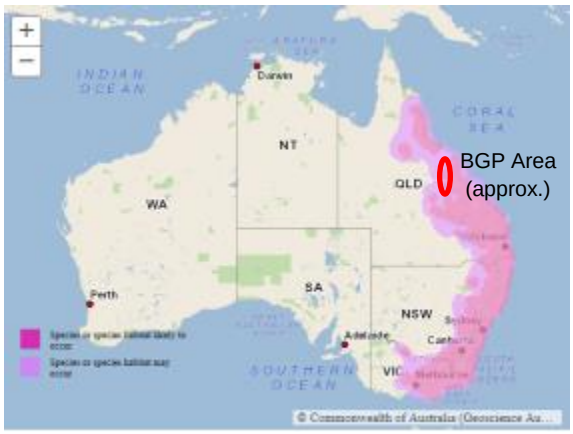
Greater Glider – *Petauroides volans*



P. volans distributiuon map (DotEE 2018k)

Photo: Australian Photography

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

The Greater Glider (*Petauroides volans*) is the largest gliding possum in Australia. Its distribution extends from the Windsor Tableland in north Queensland, south to Wombat State Forest in central Victoria (Woinarski *et al*., 2014). Inland isolated subpopulations are also known from the Gregory Range (west of Townsville) (Winter *et al*., 2004), and another in the Einasleigh Uplands bioregion of Queensland (Vanderduys *et al*., 2012).

The species is predominately restricted to eucalypt forests and woodlands. Greater gliders occur in highest abundance in taller, montane, moist eucalypt forests with larger, relatively old trees and abundant hollows (Andrews *et al*., 1994; Kavanagh, 2000; Eyre, 2004; van der Ree *et al*., 2004; Vanderduys *et al*., 2012). In areas west of the Great Dividing Range, they are found in low woodlands (McKay, 2008). The species prefers forests with a diverse range of eucalypt species, due to seasonal variation in favoured tree species (usually one or two species of eucalypt in any particular area) (Kavanagh, 1984). Even in suitable habitat, the distribution may be patchy (Kavanagh, 2000).

Home ranges are usually 1 – 4 ha in size (Henry, 1984; Kehl and Borsboom, 1984; Comport *et al*., 1996; Gibbons and Lindenmayer, 2002; Pope *et al*., 2005), however in lower productivity forest and more open woodland habitats home ranges can be up to 16 ha (Eyre, 2004; Smith *et al*., 2007). Males have a larger home range size than females and sexes usually share a den when the breeding season commences (Kavanagh and Wheeler, 2004; Pope *et al*., 2005; McKay, 2008).

Records relevant to the BGP

Although the Qld Govt (2018h) database does not hold any records of the species from within the BGP, these records do occur in the vicinity of, and surrounding, the BGP. There are also unverified records from within the northern portions of the BGP and the species is considered likely to be present to at least a limited extent. The Qld Govt (2018h) records are particularly associated with

larger tracks of native vegetation.

Presence of habitat within BGP area

The figure at Appendix D.10 shows the location of core habitat possible within the BGP as mapped by Arrow based on REs identified as being potentially suitable for the species.

General threats

Cumulative effects of clearing and logging activities, current burning regimes and the impacts of climate change are a major threat to large hollow-bearing trees on which the species relies (TSSC, 2016). In particular:

- Major habitat loss and fragmentation, mostly through clearing, clear fell logging and the loss of senescent trees due to prescribed fire regimes (Eyre, 2004; Lindenmayer *et al*., 2000; Taylor and Goldingay, 2009)
- Inappropriate fire regimes (Lindenmayer *et al*., 2013)
- Effects from climate change such as range contraction (particularly in northern parts of its range) and declines in the health of eucalypt trees (Kearney *et al*., 2010; Matusick *et al*., 2013)
- Hyper-predation by owls (McKay, 2008; Bilney *et al*., 2010; Lindenmayer *et al*., 2011)
- Increased competition for hollows from other species (e.g. sulphur-crested cockatoos)

BGP specific threats

BGP activities will require clearing of hollow-bearing trees and, in the absence of appropriate mitigation measures, would also have the potential to cause unnecessary loss, fragmentation and degradation of habitat as well as influence burning regimes. They also have the potential to cause direct injury or mortality.

BGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Habitat loss, fragmentation and degradation

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that impacts to Greater Glider habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous

vegetation, collection networks will be designed to avoid dissection (B134)

- Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Habitat trees will be retained where practicable (B137)
- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Trees will be assessed for potential nesting hollows prior to felling. If hollows are identified, trees will be felled in the presence of a qualified FSC and rolled so that the hollows are facing upwards, allowing fauna to escape (B189)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- Lighting will be designed in a manner that limits disruption on landscape character, views and visual amenity and direct lighting into the infrastructure siting rather than dispersed into native vegetation when sites are adjacent to intact habitat (B099)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480)
- Radiation exclusion zones around flares will be designed according to API standard (B485)
- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present

above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)

- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns, will be developed (B533)
- Regular patrols and inspections of pipeline easements will be conducted, including assessment of the status of signposting subsidence and of fire breaks (B536)
- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Direct injury or mortality

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- All reasonable and practicable attempts (if safe to do so) will be made to check suitable hollows for the presence of this species
- Potential breeding places will be clearly marked in the field with spray paint, coloured flagging tape (unless not permitted by land owners, e.g. some cattle properties), or by other suitable methods
- Further checks of identified potential nests will be undertaken immediately prior to commencing vegetation clearing
- Speed limits will be developed for Project controlled roads with due consideration to reduce the potential for vehicle collisions with wildlife (B154)
- During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported
- For areas mapped as core habitat for the Greater Glider, the pre-clearance survey will include observations of tree hollows
- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Based on the detection of any Greater Gliders in the locality of proposed works or adjoining areas (rather than solely on the basis of potential core habitat areas (as mapped in the EIS), the coordinates and total area of cleared their habitat will be recorded and tracked
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted

during operations, and post closure, to assess trends and performance (B591)

- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

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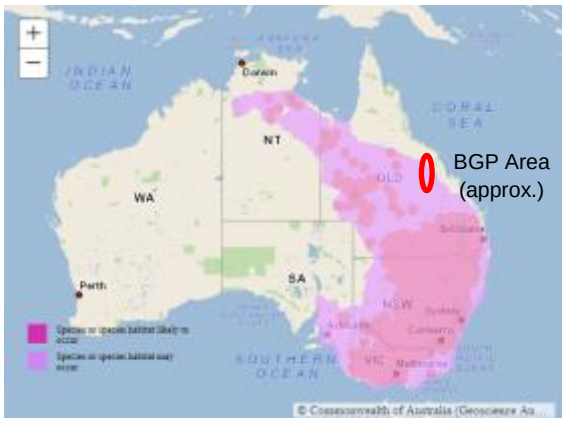
Painted Honeyeater – *Grantiella picta*



G. picta distributiuon map (DotEE 2018l)

Photo: Australian Wildlife Conservancy

Status

Vulnerable (EPBC Act); Vulnerable (Qld Nature Conservation Act)

Distribution and Habitat

Endemic to Australia, the Painted Honeyeater (*Grantiella picta*) may be found from the eastern section of the Northern Territory to Victoria and southern regions of South Australia (Pizzey and Knight, 2007). Rare in the Northern Territory, they are widespread throughout Queensland, absent only from Cape York and high rainfall areas.

Painted Honeyeaters occur mainly in dry open woodlands and forests, particularly box-ironbark woodlands. They may also be located in riparian forest, on plains with scattered eucalypts, and in remnant trees on farmland. Their occurrence is strongly associated with mistletoe, on which they feed (Higgins *et al*., 2001) and fragmented or disturbed Acacia communities often have the highest density of mistletoe. More advanced stands of Acacia regrowth may also have abundant mistletoe.

Painted Honeyeaters feed almost exclusively on mistletoe fruit, but may also collect nectar and invertebrates (Oliver *et al*., 2003). Most foraging is undertaken within the canopy of trees (Higgins *et al*., 2001).

Nesting occurs during spring-summer (September to February), predominantly in the south-east of its range north to and around Brisbane. The breeding season is determined by photoperiod to coincide with warmer summer months, but actual breeding is cued in relation to the progression of mistletoe fruiting. This ensures that breeding is matched by peak resource availability, avoiding temporal variation inherent in unpredictable environments (Barea and Watson, 2007).

Small, frail cup-shape nests with narrow sides are constructed in the outer foliage and branchlets of eucalypts, casuarinas and acacias. However, a disproportionately large number of nests are placed in mistletoe clumps in taller trees (Whitemore and Eller, 1983; Beruldsen, 2003; Barea, 2008).

While not well understood, movement patterns are generally described as a north-south migration (Keast, 1968). Populations move north during winter and return south of approximately 26^{o} during

spring-summer to breed (Higgins *et al*., 2001).

Records relevant to the BGP

There are no Painted Honeyeater records within the BGP area in the Qld Govt (2018l) database. The nearest record is approximately 20km south of the southern edge of the BGP area (south of the Blackdown Tablelands).

Presence of habitat within BGP area

The figure at Appendix D.10 shows the location of core habitat possible within the BGP as mapped by Arrow based on REs identified as being potentially suitable for the species. This mapping does not take into account the occurrence of dense mistletoe.

General threats

Habitat loss, competition with the noisy miner (*Manorina melanocephala*); predation by invasive species (e.g. *Rattus rattus*); deliberate destruction of mistletoe in production forests; exacerbation of tree decline through pasture improvement activities; collision with road vehicles; and nest predation by pied currawongs (*Strepera graculina*), pied and grey butcherbirds (*Cracticus nigrogularis* and *Cracticus torquatus*), and crows and ravens (Corvidae) (DoE, 2015b).

SGP specific threats

In the absence of appropriate mitigation measures, BGP activities have the potential to cause unnecessary loss of habitat as well as increase the incidence of collisions with road vehicles and otherwise cause direct injury or mortality.

SGP specific mitigation measures (Arrow BGP SREIS 2014 – commitment number in parenthesis)

Habitat loss and degradation

- When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database
- Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that impacts to Painted Honeyeater habitat cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked
- Disturbance within core habitat for EVNT species will be avoided where possible (B131)
- Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132)
- Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134)

- Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135)
- Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136)
- Habitat trees will be retained where practicable (B137)
- Trees will be felled away from existing vegetation not identified for removal where practicable (B150)
- Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Trees will be assessed for potential nesting hollows prior to felling. If hollows are identified, trees will be felled in the presence of a qualified FSC and rolled so that the hollows are facing upwards, allowing fauna to escape (B189)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)

Direct injury or mortality (including vehicle strike)

- Harassment of wildlife and the unauthorised collection of flora or fauna will be prohibited, unless directed by a suitably qualified and experienced person (B149)
- Suitably qualified animal handler or ecologist will be used to capture injured wildlife, where possible. Injured wildlife resultant from land clearing will be taken to a qualified veterinary surgeon or carer where practical (B153) The FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- All reasonable and practicable attempts (if safe to do so) will be made to check suitable hollows for the presence of this species
- Potential breeding places will be clearly marked in the field with spray paint, coloured flagging tape (unless not permitted by land owners, e.g. some cattle properties), or by other suitable methods
- Further checks of identified potential nests will be undertaken immediately prior to commencing vegetation clearing
- Speed limits will be developed for Project controlled roads with due consideration to reduce the potential for vehicle collisions with wildlife (B154)
- During rehabilitation works, care will be taken when moving stockpiled logs and vegetation to avoid fauna mortality (B186)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- Fauna Management Procedure (ORG-ARW-HSM-PRO-00067) – this document informs all Arrow staff and contractors of their obligations to protect and manage native fauna whilst operating on Arrow controlled works sites. It includes the requirements to:
  - Record and report all interactions with fauna to the Arrow Ecologist (notification within 24 hours using the Fauna Incident Notification (FIN) form is required for listed threatened, near threatened and special least concern fauna)
  - Record and report all interactions with fauna to the regulator, under their own permit, as required (but not before reporting to the Arrow Ecologist)
  - Mitigation measures that have been constructed and implemented (e.g. fauna exclusion fences) must be monitored regularly and their effectiveness reported by the Site Supervisor
  - Any ongoing actions required (e.g. monitoring and maintenance) are to be clearly communicated during site handover processes, and must be implemented, monitored and their effectiveness reported
- For areas mapped as core habitat for the Painted Honeyeater, the pre-clearance survey will include observations for areas of dense mistletoe
- A FSC will be at the site on the day of clearing. The FSC will be a suitably qualified ecologist as per the definition provided in EPBC 2012/6377. The number of FSCs on site at the time of clearing will depend on the number of machines being used at any given time
- Based on the detection of any Painted Honeyeaters in the locality of proposed works or adjoining areas (rather than solely on the basis of potential core habitat areas (as mapped in the EIS), the coordinates and total area of cleared their habitat will be recorded and tracked
- Data collection, particularly of EVNT species identified during pre-clearance surveys, during trench checking or in other Project related activities, will be ongoing until rehabilitation is complete (B163)
- Monitoring will be conducted during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted

during operations, and post closure, to assess trends and performance (B591)

- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

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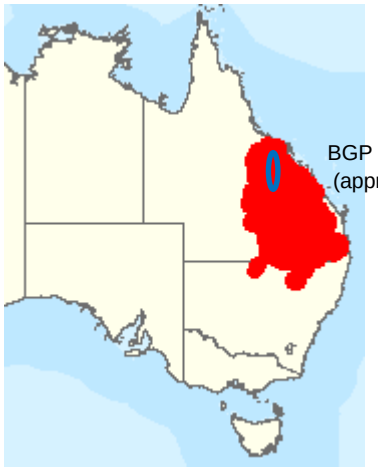
Brigalow (*Acacia harpophylla* dominant and co-dominant)	
 Brigalow distribution map (DotEE, 2018m)	 Photo: KBR
EPBC Act Status	
Endangered	
Communities relevant to the BGP	
The Brigalow TEC is relatively common in the BGP area with a number of well-preserved habitats surveyed as part of the EIS (Arrow, 2014) in more extensive areas of intact remnant vegetation supporting the following Regional Ecosystems (REs), although the majority of habitats exists as scattered, poorly preserved fragments (Arrow, 2014). The following REs which equate to the Brigalow TEC have been recorded in the BGP area: • RE11.3.1 - *Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains • RE11.4.7 - *Eucalyptus populnea* with *Acacia harpophylla* and/or *Casuarina cristata* open forest to woodland on Cainozoic clay plains • RE11.4.8 - *Eucalyptus cambageana* woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains • RE11.4.9 - *Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains • RE11.5.16 - *Acacia harpophylla* and/or *Casuarina cristata* open forest in depressions on Cainozoic sand plains and remnant surfaces • RE11.9.1 - *Acacia harpophylla-Eucalyptus cambageana* woodland to open forest on fine-grained sedimentary rocks • RE11.9.5 - *Acacia harpophylla* and/or *Casuarina cristata* open forest on fine-grained sedimentary rocks This TEC also includes advanced (>15 yrs) Brigalow regrowth communities.	

Presence of habitat within BGP area
Core habitat for the TEC within the BGP has been mapped and is illustrated in the figure at Appendix D.10.
General threats
Clearing, fire, weeds, feral animals and inappropriate grazing (DoE, 2013).
SGP specific threats
Disturbance of up to a maximum of 781.16 ha of core habitat for this TEC is included in EPBC Act decision (EPBC 2012/6377). Without adequate mitigation measures in place, BGP activities would have the potential to remove and disturb additional habitat and contribute to altered fire frequency and increased weeds and feral animals.
SGP specific mitigation measures (Arrow SGP SREIS 2013 – commitment number in parenthesis)
Habitat loss, fragmentation and disturbance • When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that areas of Brigalow TEC cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked • Disturbance within TECs will be avoided where possible (B131) • Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132) • Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134) • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135) • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136) • Trees will be felled away from existing vegetation not identified for removal where practicable (B150) • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140)

- Plant species used for rehabilitation will be specific to the original ecosystem and local provenance, wherever possible unless the area has been cropped or contains improved pasture to be reinstated (B162)
- Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)
- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339)
- Any residual impacts to Brigalow TEC will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480)
- Radiation exclusion zones around flares will be designed according to API standard (B485)
- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)
- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g.,

flaring or shutdowns, will be developed (B533)

- Regular patrols and inspections of pipeline easements will be conducted, including assessment of the status of signposting subsidence and of fire breaks (B536)
- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Weeds and feral animals

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180)
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing

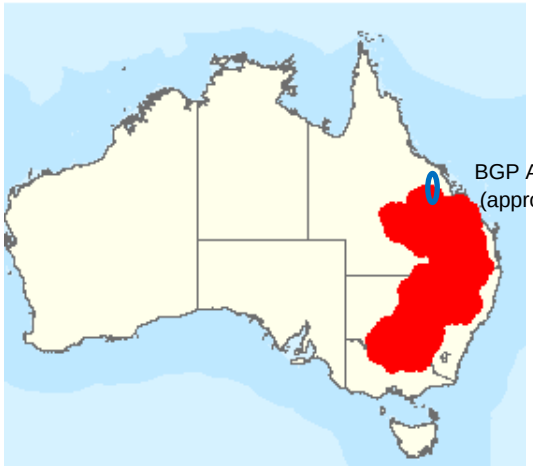
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- Pipeline RoWs will be routinely inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095)
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting.
- In accordance with the Pest Management Plan routinely inspect for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

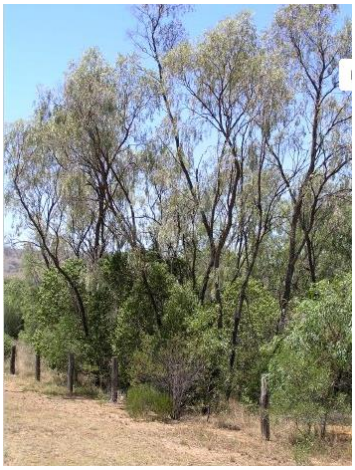
References

- Arrow Energy (2014). Supplementary Report to the Bowen Gas Project Environmental Impact Statement.
- DoE (2013). Approved Conservation Advice for the Brigalow (Acacia harpophylla dominant and co-dominant) ecological community. Canberra: Department of the Environment. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/028-conservation-advice.pdf. In effect under the EPBC Act from 17-Dec-2013.
- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018m). Species Profile and Threats Database – Brigalow (*Acacia harpophylla* dominant and co-dominant). SPRAT Profile. Sourced from: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=28 on 12

April 2018.

Weeping Myall (*Acacia pendula*) Woodlands





Weeping Myall Woodlands distribution map (DotEE, 2018n) Photo: OEH (2018)

EPBC Act Status

Endangered

Communities relevant to the BGP

The Weeping Myall Woodland TEC has not been confirmed within the BGP area. However, the TEC is restricted to small patches within two REs in Queensland (TSSC, 2009) namely:

- RE 11.3.2 *Eucalyptus populnea* woodland on alluvial plains
- RE 11.3.28 *Casuarina cristata* +/- *Eucalyptus collabah* open woodland on alluvial plains

and these two REs are associated with watercourse alluviums throughout the BGP area (see figure at Appendix D.11).

Presence of habitat within BGP area

The distribution of the Weeping Myall Woodland TEC, as shown by DotEE (2018l) and the more detailed map from DEWHA (2008e), is outside of almost all of the BGP area. The southern portion around Blackwater is the only part of the BGP area that is coincident with the mapped distribution for this TEC.

Although Arrow have included all areas mapped as containing either RE 11.3.2 or RE 11.3.28 as core habitat possible (as illustrated in the figure at Appendix D.11), the results of ongoing pre-clearance surveys will be taken into account in confirming and calculating actual areas of impact to this TEC within the BGP area (if any).

General threats

Clearing and degradation for agriculture and from overgrazing, weed invasion and herbivory by caterpillars of the Bag-shelter Moth (DEWHA, 2008d).

SGP specific threats
Disturbance of up to a maximum of 79.68 ha of core habitat for this TEC is included in EPBC Act decision (EPBC 2012/6377). Without adequate mitigation measures in place, BGP activities would have the potential to remove and disturb additional habitat and contribute to an increase in weeds.
SGP specific mitigation measures (Arrow SGP SREIS 2013 – commitment number in parenthesis)
Habitat loss and disturbance • When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that areas of Weeping Myall Woodland TEC cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked • Disturbance within TECs will be avoided where possible (B131) • Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132) • Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134) • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135) • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136) • Trees will be felled away from existing vegetation not identified for removal where practicable (B150) • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140) • Plant species used for rehabilitation will be specific to the original ecosystem and local provenance, wherever possible unless the area has been cropped or contains improved pasture to be reinstated (B162) • Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182) • Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)

- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339)
- Any residual impacts to Weeping Myall TEC (if any) will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Weeds

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180))
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy

addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas

- Based on the detection of any Weeping Myall Woodland TEC in the locality of proposed works (rather than solely on the basis of potential core habitat areas (as illustrated in the figure at Appendix D.11)), the coordinates and total area of cleared TEC will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting
- Pipeline RoWs will be routinely inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095)
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting.
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- In accordance with the Pest Management Plan routine inspections will be conducted for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

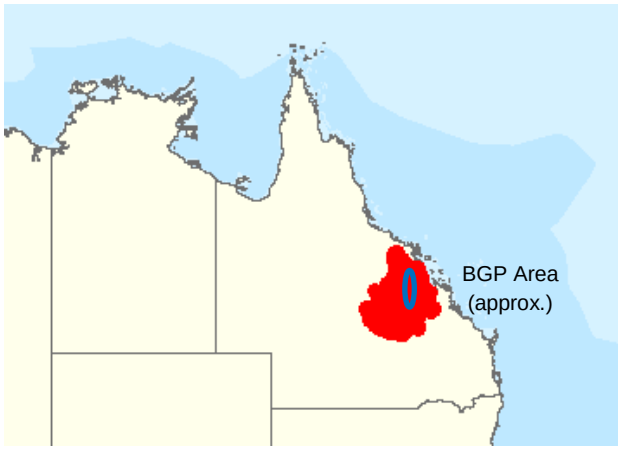
References

- Arrow Energy (2014). Supplementary Report to the Bowen Gas Project Environmental Impact Statement.
- DEWHA (2008d). *Approved Conservation Advice for Weeping Myall Woodlands ecological community*. Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/98-conservation-advice.pdf. In effect under the EPBC Act from 07-Jan-2009.
- DEWHA (2008e). Area in which remnants of the Weeping Myall Woodlands ecological

community may occur. Accessed from: http://www.environment.gov.au/biodiversity/threatened/communities/maps/pubs/98-map.pdf on 12 April 2018.

- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018n). Species Profile and Threats Database – Weeping Myall Woodlands. SPRAT Profile. Sourced from: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=98 on 12 April 2018.
- OEH (2018). Photo sourced from Hunter Valley Weeping Myall Woodland in Sydney Basin Bioregion – profile at: http://www.environment.nsw.gov.au/threatenedSpeciesApp/profile.aspx?id=20030. Accessed on 12 April 2018.
- TSSC (2009). *Commonwealth Listing Advice on Weeping Myall Woodlands*. Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/98-listing-advice.pdf. In effect under the EPBC Act from 07-Jan-2009.

Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin



Native Grassland distribution (DotEE, 2018o)

Photo: Steve Fox (KBR)

EPBC Act Status

Endangered

Communities relevant to the BGP

The Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin (Native Grassland) TEC is endemic to Queensland and broadly occurs where the Fitzroy River Basin and the Brigalow Belt North coincide. The natural grassland TEC extends from Collinsville in the north to Carnarvon National Park in the south (DEWHA, 2008f).

The TEC is relatively common in the BGP area and is represented by (Arrow, 2014):

- RE 11.3.21 – *Dichanthium sericeum* and/or *Astrebla* spp. Grassland on alluvial plains. Cracking clay soils.
- RE 11.4.4 – *Dichanthium* spp., *Astrebla* spp. Grassland on Cainozoic clay plains
- RE 11.4.11 – *Dichanthium sericeum*, *Astrebla* spp. And patchy *Acacia harpophylla, Eucalyptus coolabah* on Cainozoic clay plains
- 11.8.11 – *Dichanthium sericeum* grassland on Cainozoic igneous rocks
- 11.9.3 – *Dichanthium* spp., *Astrebla* spp. Grassland on fine-grained sedimentary rocks.

Presence of habitat within BGP area

The most extensive, best quality areas of this TEC run in a broad belt trending in an east-west direction between Glenden and Moranbah in the north of the BGP area, although fragmented remnants persist as far south as Middlemount.

Core habitat for the TEC within the BGP has been mapped and is illustrated in the figure at Appendix D.12.

General threats
Grazing, cropping and pasture improvement, weeds and pest animals, mining activities and construction of roads and other infrastructure are the main identified threats (DEWHA, 2008f, DSEWPAC, 2012b).
SGP specific threats
Disturbance of up to a maximum of 871.10 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377). Without adequate mitigation measures in place, BGP activities would have the potential to remove and disturb additional habitat and contribute to increased weeds and feral animals. They also have to potential to impact this species through soil compaction (to cracking clay soils) and mixing.
SGP specific mitigation measures (Arrow SGP SREIS 2013 – commitment number in parenthesis)
Habitat loss, fragmentation and disturbance • When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that areas of Natural Grassland TEC cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked • Disturbance within TECs will be avoided where possible (B131) • Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132) • Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134) • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135) • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136) • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140) • Plant species used for rehabilitation will be specific to the original ecosystem and local provenance, wherever possible unless the area has been cropped or contains improved pasture to be reinstated (B162) • Construction activities in sensitive areas will be supervised to ensure appropriate methods

(e.g., narrowing of RoW) are being implemented, where required (B182)

- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339)
- Any residual impacts to Native Grassland TEC will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Weeds and feral animals

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180)
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Soil compaction and mixing

- Stripped and salvaged soil will be re-used within a short period of time in areas where rehabilitation immediately follows installation of low key infrastructures (B040)
- Topsoil and associated vegetation will be appropriately stockpiled separately for rehabilitation prior to excavation or earthworks (B042)
- Soil will be stripped according to designated profile depths, subject to further field investigations during stripping (B051)

- Where practicable, stripped material will be placed directly onto area to be rehabilitated and spread immediately (if rehabilitation sequences and weather conditions permit) to avoid the requirement for stockpiling (B052)
- Soils will be separated into windrows for later collection or re-spreading to minimise compression effects of heavy equipment (B053)
- Soil transported by dump trucks may be placed directly into storage. Soil transported by scrapers will be pushed to form stockpiles by other equipment (e.g. dozer) to avoid tracking over previously laid soil to minimise compaction (B054)
- Surface of soil stockpiles will be left in as coarsely structured a condition as possible to promote infiltration and minimise erosion until vegetation is established or suitable erosion controls have been applied, and to prevent anaerobic zones from forming (B055)
- Pipeline construction will be conducted in a manner that limits the duration of exposure of soils. Stripped and salvaged soil will be re-used within a short period of time (i.e. 28 days) in areas where rehabilitation immediately follows the installation of pipelines (B063)
- Rehabilitation plans will be developed addressing ground preparation requirements, natural and constructed drainage patterns, soil erodibility, contamination, slope steepness and length, vegetation cover, land use and landowner requirements (B064)
- Topsoil will be stripped, salvaged and stockpiled separately from subsoils (B068)

Monitoring

Arrow will implement the following:

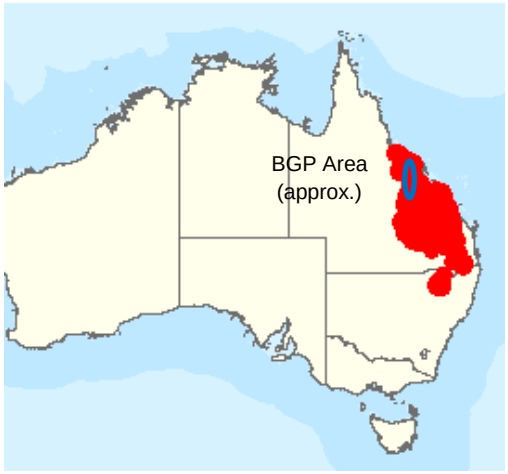
- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas
- Pipeline RoWs will be routinely inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095)
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting.
- In accordance with the Pest Management Plan routinely inspect for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the

surrounding environment (B177)

- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- Arrow Energy (2014). Supplementary Report to the Bowen Gas Project Environmental Impact Statement.
- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018o). Species Profile and Threats Database – Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin. SPRAT Profile. Sourced from: http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=99 on 16 April 2018.
- DEWHA (2008f). *Approved Conservation Advice for Natural grasslands of the Queensland Central Highlands and the northern Fitzroy Basin*. Canberra: Department of the Environment, Water, Heritage and the Arts. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/99-conservation-advice.pdf. In effect under the EPBC Act from 07-Jan-2009.
- DSEWPAC (2012b). Nationally Threatened Ecological Communities: Natural Grasslands on Basalt and Fine-textured Alluvial Plains of the Northern New South Wales and Southern Queensland, and Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin. Commonwealth of Australia. Canberra. Available from http://www.environment.gov.au/system/files/resources/347c5d4e-cef8-411c-b53c-bed3ed1d3e1c/files/bio237-0512-natural-grasslands-guide.pdf. Sourced 16 April 2018.

Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT)	
	
SEVT distribution map (DotEE, 2018p)	Photo: KBR

EPBC Act Status

Endangered

Communities relevant to the BGP

The SEVT TEC in the BGP area includes the following REs:

- RE 11.3.11 – Semi-evergreen vine thicket on alluvial plains
- RE 11.4.1 – Semi-evergreen vine thicket ± Casuarina cristata on Cainozoic clay plains
- RE 11.5.15 – Semi-evergreen vine thicket on Cainozoic sand plains/remnant surfaces
- RE 11.7.1x1 – Semi-evergreen vine thicket (as part of *Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana* or *E. microcarpa* woodland on lower scarp slopes on Cainozoic lateritic duricrust)
- RE 11.8.3 – Semi-evergreen vine thicket on Cainozoic igneous rocks
- RE 11.8.13 – Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks
- RE 11.9.4 – Semi-evergreen vine thicket on Cainozoic fine-grained sedimentary rocks
- RE 11.11.18 – Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding.

Presence of habitat within BGP area

Field studies have identified good quality examples consistent with RE 11.8.3 on basaltic terrains north of Newlands Mine (Arrow, 2014).

Core habitat for the TEC within the BGP has been mapped and is illustrated in the figure at

Appendix D.13.
General threats
Clearing and fragmentation, fire, weeds, feral animals and inappropriate grazing (McDonald, 2010, DECCW, 2010 and DotEE, 2018p).
SGP specific threats
Disturbance of up to a maximum of 107.42 ha of core habitat for this species is included in EPBC Act decision (EPBC 2012/6377). Without adequate mitigation measures in place, BGP activities would have the potential to remove and disturb additional habitat and contribute to altered fire frequency and increased weeds and feral animals.
SGP specific mitigation measures (Arrow SGP SREIS 2013 – commitment number in parenthesis)
Habitat loss, fragmentation and disturbance • When the project activities proceed through the detailed planning phase, a field inspection of the specified disturbance footprint (this is specified by a surveyor in the field) will be undertaken by a suitably qualified ecologist and the presence, absence and extent of environmental values will be verified and mapped in the field via GIS. The results of this step will be recorded within Geocortex and the Arrow Sharepoint database • Where environmental values are confirmed, a 'framing trade-offs' session will be held with the project engineers, planners and ecologists to determine if the location of the activities can be modified to avoid and/or reduce the impact to environmental values. In the event that areas of SEVT TEC cannot be avoided, the actual area to be cleared will be surveyed to quantify the impacts. This data will be recorded and cumulative impact areas tracked • Disturbance within TECs will be avoided where possible (B131) • Pre-construction / pre-clearance surveys will be conducted to identify any additional areas that need to be avoided (B132) • Infrastructure will be designed to avoid undisturbed tracts of remnant vegetation, where practical. Where collection and gathering infrastructure is to be placed within contiguous vegetation, collection networks will be designed to avoid dissection (B134) • Access track location will avoid the repeated isolation of small parcels of remnant vegetation from more continuous tracts (B135) • Vegetation disturbance will be minimised wherever practical. Corridors for linear infrastructure will be as narrow as practical, particularly when crossing linear corridors of vegetation (e.g. Isaac River and Suttor Creek). Areas cleared for field development will be as small as practical (B136) • Trees will be felled away from existing vegetation not identified for removal where practicable (B150) • Access tracks and pipelines will deviate around sensitive vegetation where practicable (B140) • Construction activities in sensitive areas will be supervised to ensure appropriate methods (e.g., narrowing of RoW) are being implemented, where required (B182)

- Damaging trees (e.g. through scraping of tree trunk or breaking of limbs by equipment) not identified for removal will be avoided where practicable (B151)
- Delineation of disturbance boundary limits of works will be clearly established prior to commencement of clearing and soil stripping (B049)
- Plant species used for rehabilitation will be specific to the original ecosystem and local provenance, wherever possible unless the area has been cropped or contains improved pasture to be reinstated (B162)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- A rehabilitation management plan for decommissioning will be developed and implemented which includes monitoring and maintenance of rehabilitated areas until rehabilitation sign off criteria are met (B339)
- Any residual impacts to SEVT TEC will be offset. A detailed BGP Phase 1 Offset Strategy and additional offset strategies for the subsequent phases will be developed and implemented to add value rather than just compensating for impacts (if any)

Fire

- Project infrastructure and facilities will be designed and constructed in accordance with applicable codes and standards (B477)
- Fire management plans will be developed for production facilities (B471)
- Arrow will develop emergency response plans in consultation with emergency services organisations that includes a list of required equipment, training and other resources, and foreseeable emergency and crisis situations (including escapes, blowouts, gas fire, bushfire, critical equipment failure, trapped or missing people, flooding, cyclones, power failure, security incidents and threats, and transport incidents). The plans will include safe evacuation procedures, communication protocols (internal and to emergency services, including the Petroleum and Gas Inspectorate), accounting for personnel and visitors, roles and responsibilities, and requirements for training (B480)
- Radiation exclusion zones around flares will be designed according to API standard (B485)
- Enclosed spaces where flammable gas may accumulate will be minimised (B487)
- Fire-fighting equipment will be installed, inspected and serviced in accordance with risk assessments and relevant legislation and standards (B499)
- Gathering lines will be buried at a minimum depth of 600 mm. Where gathering lines are present above the ground (at wellheads and at vents or drains), a clear area will be maintained. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B503)
- Fire-safety equipment will be commissioned in the early phase of the construction period (B505)
- All buildings and production facilities will be fitted with smoke or fire alarms (B506)
- Fire and gas detection systems to shutdown compressors will be installed (B508)
- Protocols for the control of operational activities during extreme fire danger periods, e.g., flaring or shutdowns, will be developed (B533)
- Regular patrols and inspections of pipeline easements will be conducted, including

assessment of the status of signposting subsidence and of fire breaks (B536)

- Vegetation surrounding production facilities and wellheads will be maintained in a manner that limits the amount of combustible material in the area. The size of the cleared area will be determined on a site-by-site basis with consideration of the site-specific risk of bushfire (B544)
- Access tracks to well sites will be kept clear of dry grass and combustible material wherever practicable and where there is a higher risk of bushfire (to minimise the risk of dry grass being ignited by hot components of vehicles accessing the sites) (B547)
- Daily operations will be managed with consideration of the fire danger current at that time (B548)

Weeds and feral animals

- A declared weed and pest management plan will be developed in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Species-specific management will be undertaken for identified key weed species at risk of spread through project activities (Mesquite, Parthenium Weed, African Lovegrass and Lippia). Weed control efforts will be increased in areas particularly sensitive to invasion. The pest management plan will include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures (B191)
- When sourcing maintenance materials, such materials such as bedding sand, topsoil, straw bales and sand bags will be brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is possible risk of contamination in products (B180)
- All relevant personnel will be made aware of the location and extent of weed infestations in the vicinity of the work area and the risks involved in moving from one site or property to another (B188)
- Construction and maintenance activities will be planned to minimise movement of plant and equipment between properties or areas with weed infestations (B230)
- Weed monitoring (and targeted weed control measures) will be undertaken within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)

Grazing

- Grazing activities will be excluded from all Arrow gas and water processing and well head infrastructure sites

Monitoring

Arrow will implement the following:

- Ecological Impact Assessment Procedure (ORG-ARW-HSM-PRO-00070) – this document provides the step by step process implemented for all Arrow development activities that involve significant disturbance to land, including the requirement to record the GPS coordinates and maps of all vegetated areas that have required clearing
- As per Condition 13 of the *Variations to Conditions Attached to Approval* (25/03/2018) for the BGP (EPBC 2012/6377), no Project Phases will commence until an Offset Strategy

addressing offset obligations for that Project Phase has been developed by Arrow and approved by the Minister. Each Strategy will set out a program for monitoring and reporting on the effectiveness of the management measures, and identify the performance and completion criteria to be tracked for the offset areas

- Pipeline RoWs will be routinely inspected until ground stabilisation and natural revegetation or pasture grasses or crops are established (B095)
- Weed monitoring and targeted weed control measures will be implemented within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- habitats (particularly threatened communities such as Brigalow and native grasslands) (B158)
- Monitoring will be undertaken during and after clearing activities to ensure no unauthorised encroachment has occurred (B167)
- The coordinates and total area of cleared habitat will be recorded and tracked monthly against approved maximum disturbance limits and used for annual compliance reporting.
- In accordance with the Pest Management Plan routinely inspect for pest flora and evidence of pest fauna within Project disturbed areas (B171)
- After decommissioning, rehabilitation areas will be inspected for regrowth similar to the surrounding environment (B177)
- Routine monitoring of rehabilitation success will be undertaken (B183)
- Buffer zones and the Project footprint will be routinely monitored using satellite imagery (B215)
- Monitoring of the rehabilitated areas will be undertaken to identify whether the general objectives of the rehabilitation strategy are being met, and whether a sustainable and stable landform has been achieved. Monitoring will be conducted by suitably skilled and qualified persons at representative locations. Annual reviews of monitoring data will be conducted during operations, and post closure, to assess trends and performance (B591)
- Monitoring and inspection of avoidance, mitigation and management measures will be implemented to ensure the impacts and residual risks continue to be low throughout the lifetime of the Project (B640)

References

- Arrow Energy (2014). Supplementary Report to the Bowen Gas Project Environmental Impact Statement.
- DECCW (2010). Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar bioregions. State of NSW and Department of Environment, Climate Change and Water NSW. Accessed from: http://www.environment.nsw.gov.au/resources/threatenedspecies/SvetEECweb.pdf on 16 April 2018.
- DotEE (2014). Approval – Arrow Bowen Gas Project (EPBC 2012/6377). Signed 27 October 2014.
- DotEE (2018p). Species Profile and Threats Database – Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions. SPRAT Profile. Sourced from:

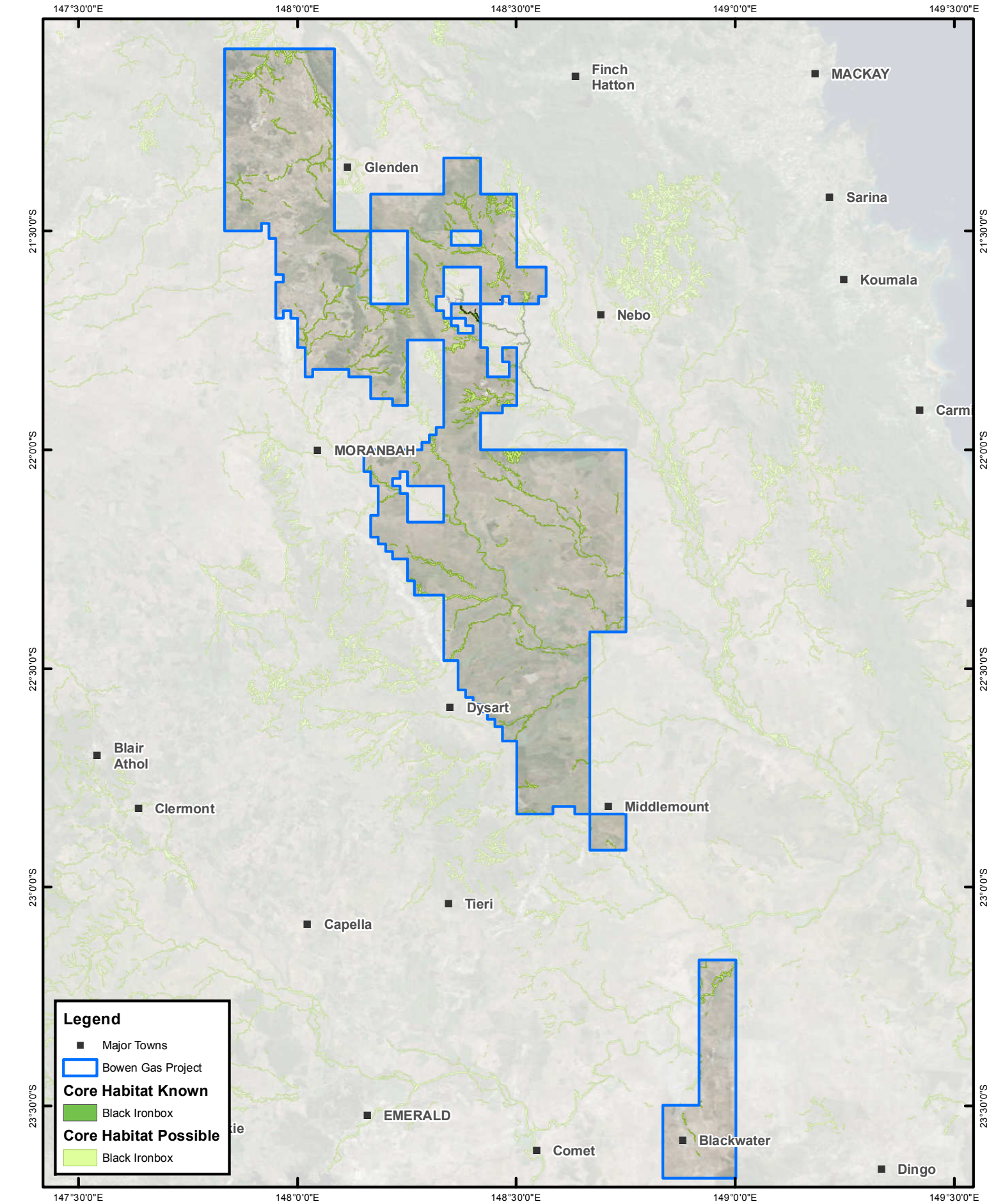
http://www.environment.gov.au/cgi-bin/sprat/public/publicshowcommunity.pl?id=24 on 12 April 2018.

- McDonald, W.J.F (2010). *National recovery plan for the "Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions" ecological community*. Report to Department of the Environment, Water, Heritage and the Arts, Canberra. Queensland Department of Environment and Resource Management, Brisbane. Available from: http://www.environment.gov.au/resource/national-recovery-plan-semi-evergreen-vine-thickets-brigalow-belt-north-and-south-and. In effect under the EPBC Act from 12-Mar-2010.
- TSSC (2001). *Commonwealth Listing Advice on Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions*. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/sevt.html. In effect under the EPBC Act from 04-Apr-2001.

APPENDIX D

Figures D1-12

Core habitat areas for EPBC Act Species and Communities



Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

N

Coordinate System: GCS GDA 1994

0 12.5 25 50
km

Figure D.1 Bowen Gas Project

Black Ironbox
Core Habitat Known and Possible

Date: 26/04/2018

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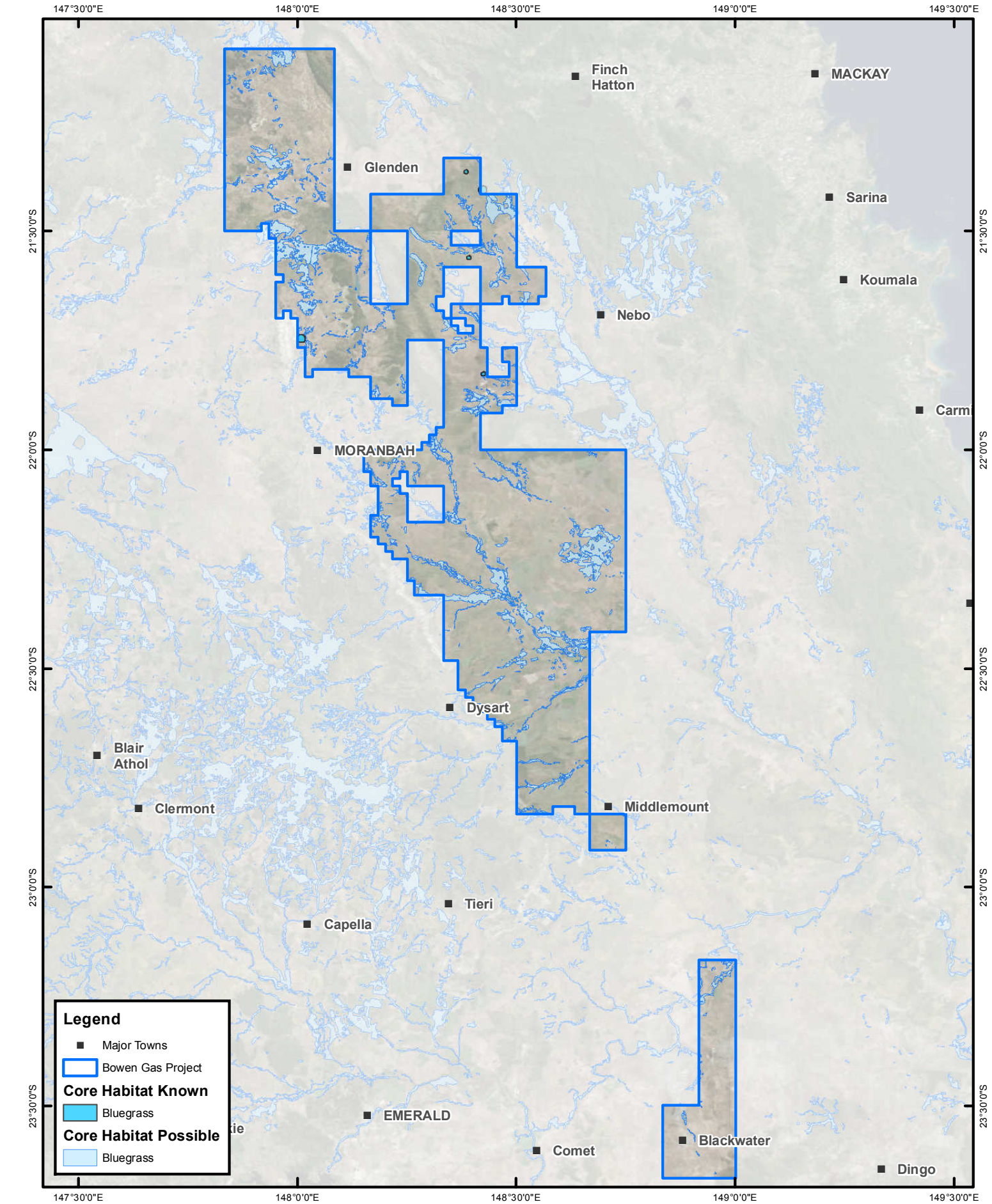

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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km

Figure D.2 Bowen Gas Project

Bluegrass
Core Habitat Known and Possible

Date: 26/04/2018

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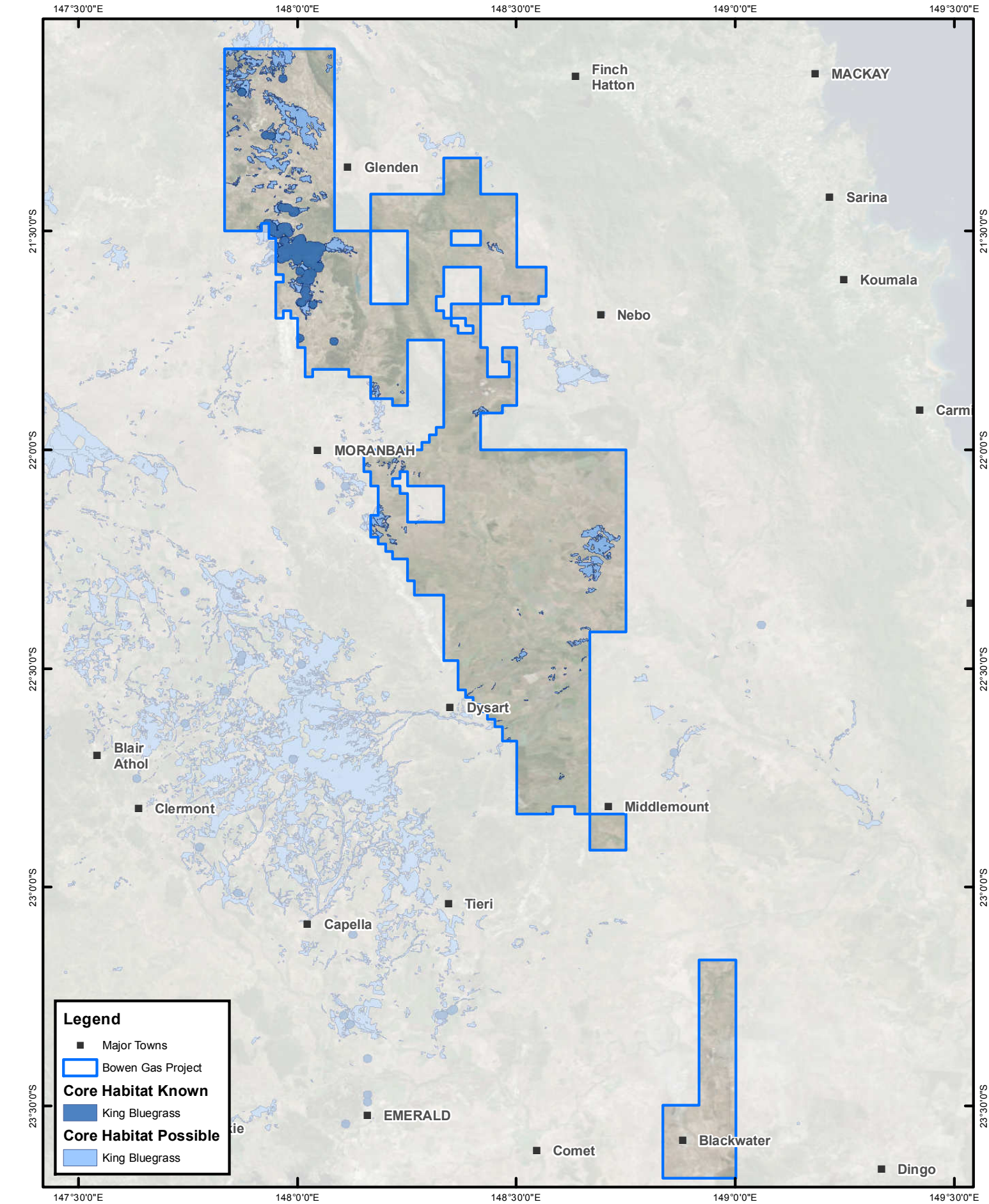

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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km

Figure D.3 Bowen Gas Project

King Bluegrass
Core Habitat Known and Possible

Date: 26/04/2018

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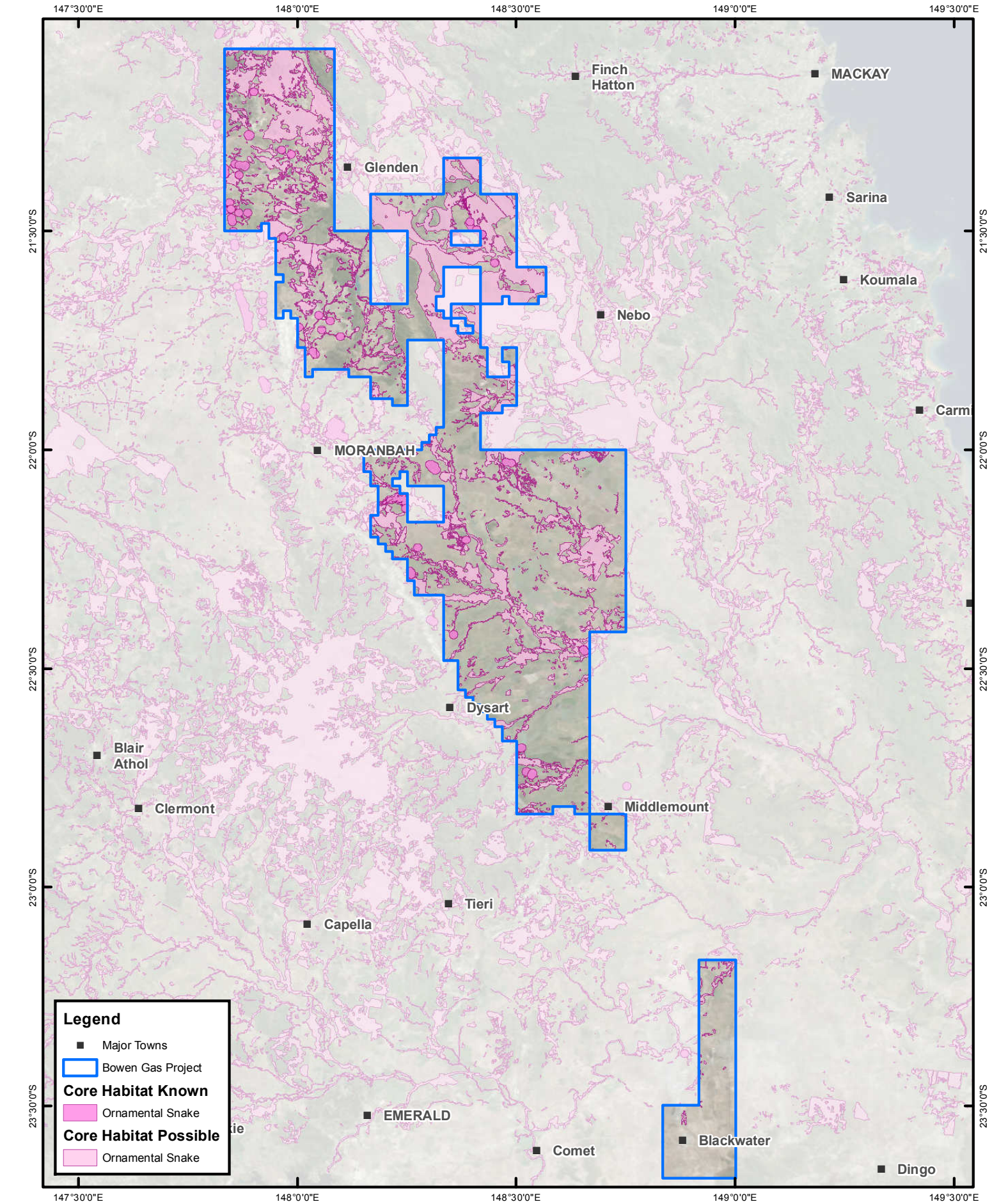

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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Figure D.4 Bowen Gas Project

Ornamental Snake
Core Habitat Known and Possible

Date: 26/04/2018

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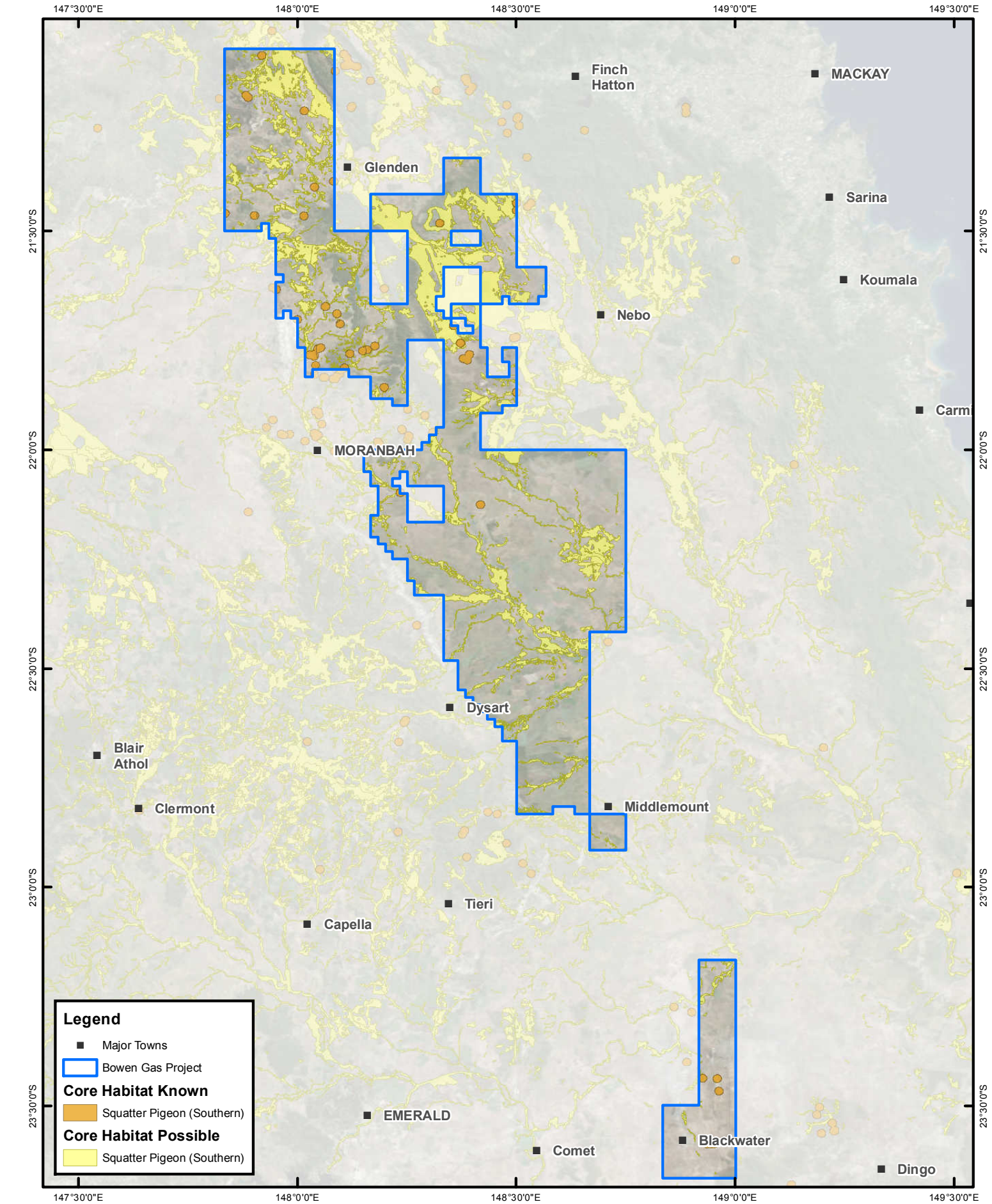

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

Figure D.5 Bowen Gas Project

Squatter Pigeon (Southern) Core Habitat Known and Possible

Date: 26/04/2018

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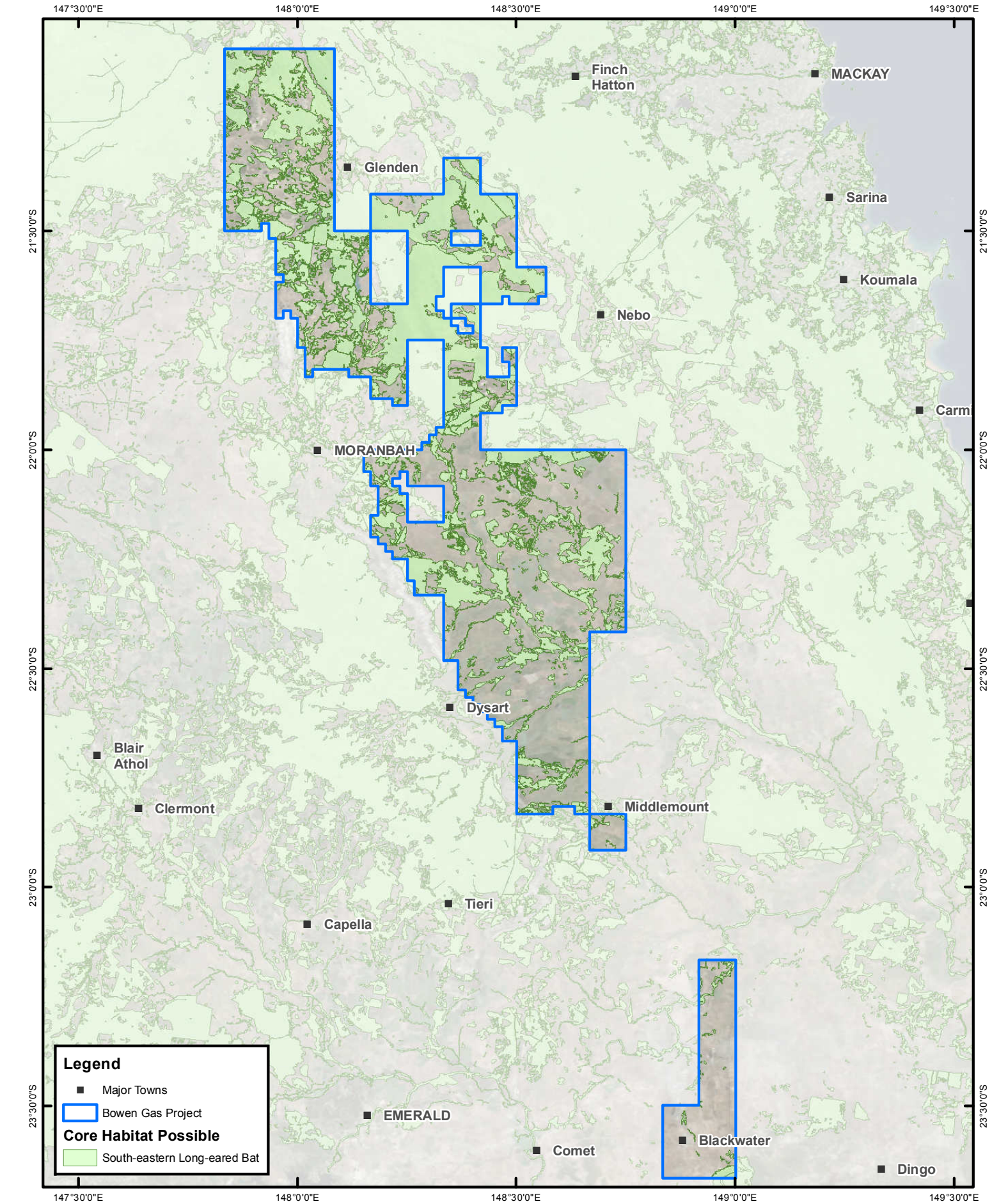

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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Figure D.8 Bowen Gas Project

South-eastern Long-eared Bat Core Habitat Possible

Date: 26/04/2018

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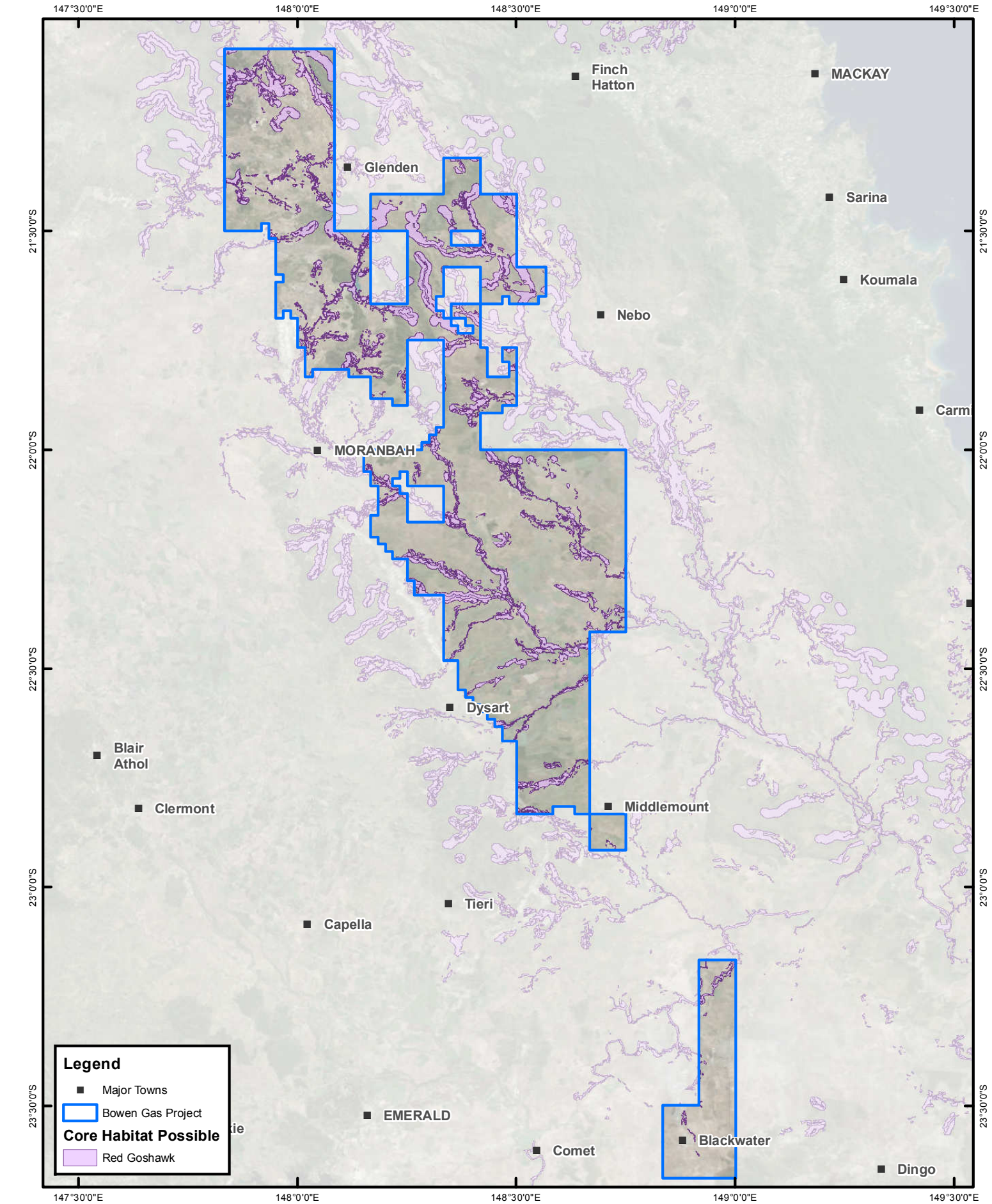

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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km

Figure D.6 Bowen Gas Project

Red Goshawk
Core Habitat Possible

Date: 26/04/2018

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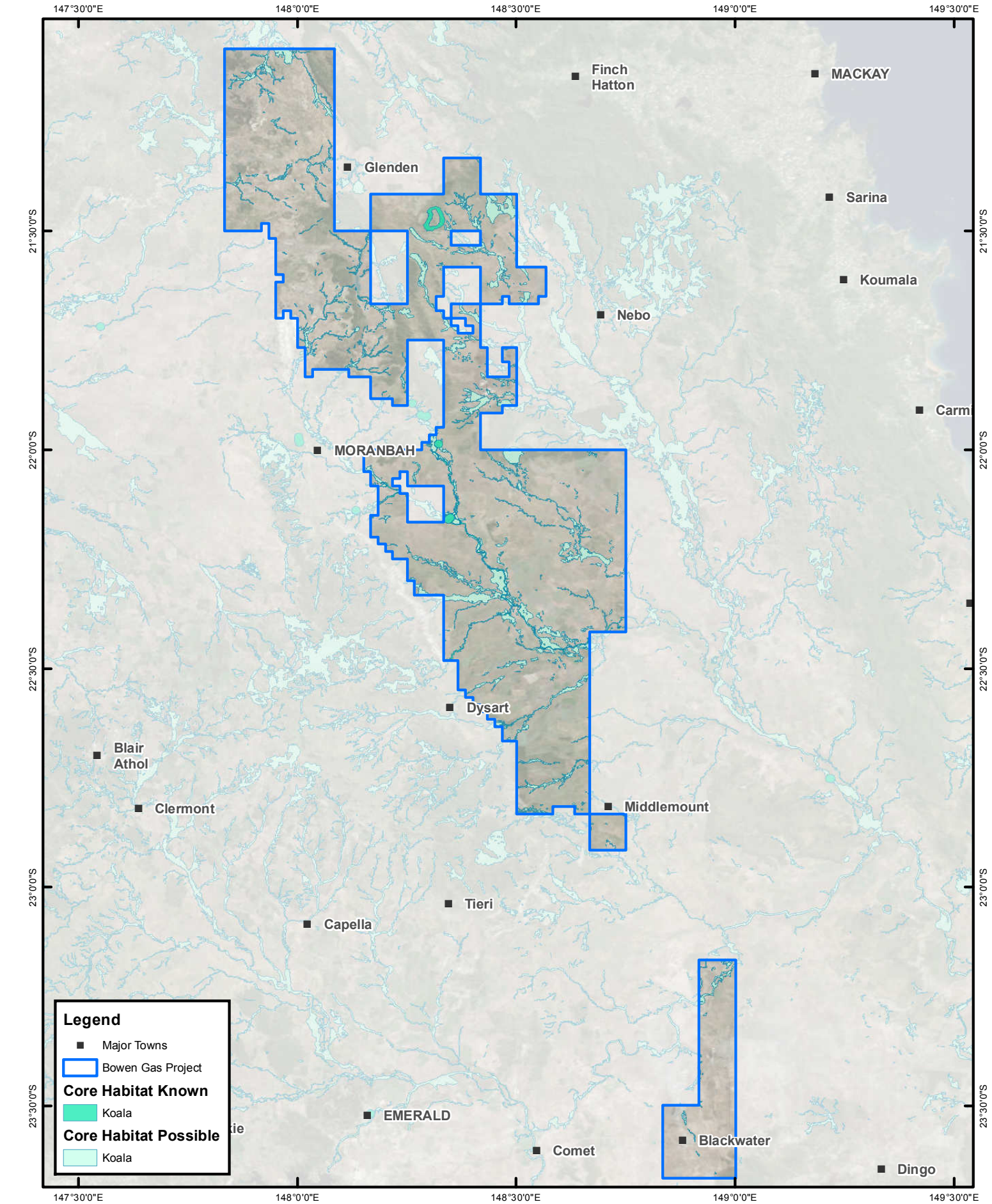

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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Figure D.7 Bowen Gas Project

Koala
Core Habitat Known and Possible

Date: 26/04/2018

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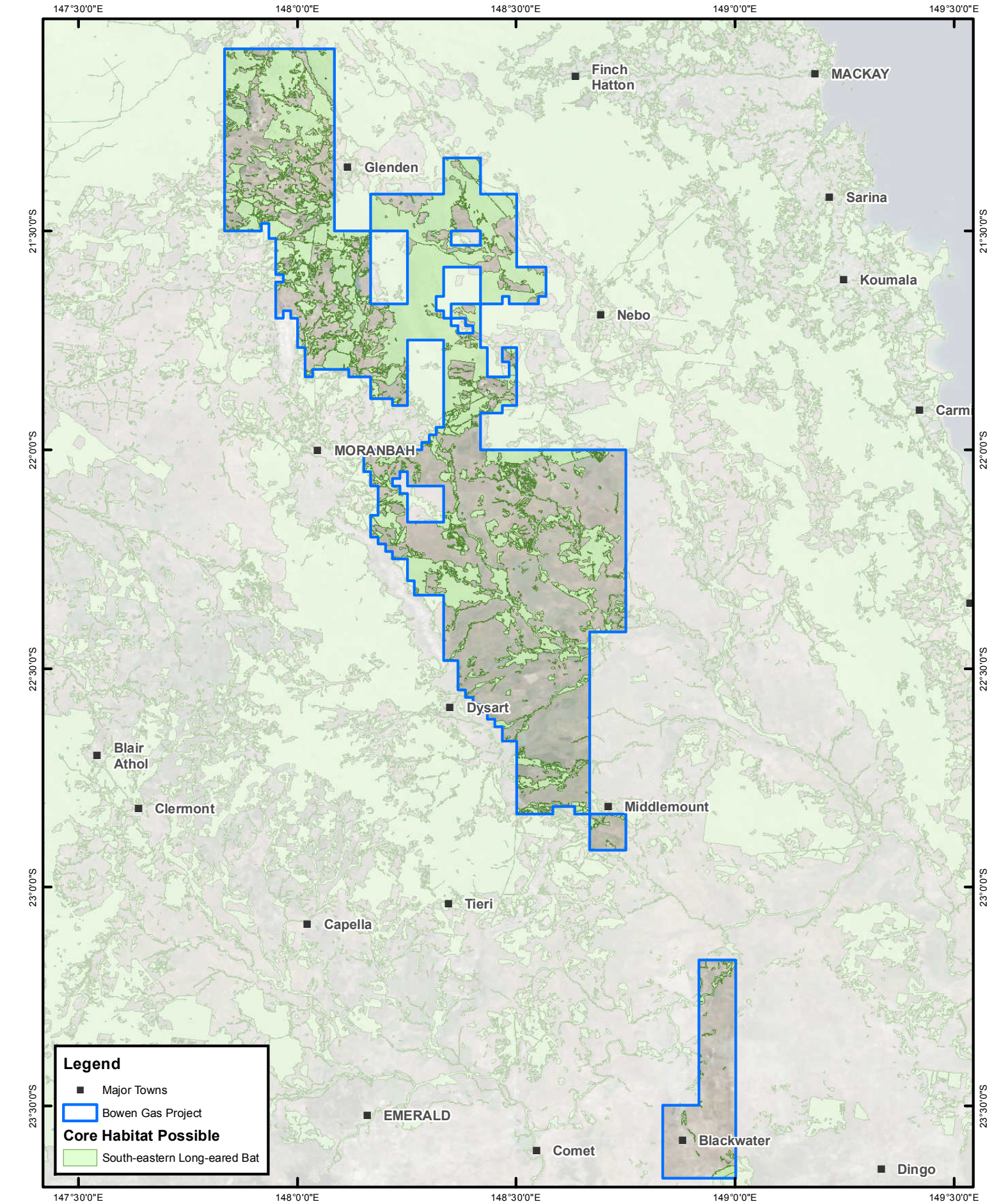

Source:
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Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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Figure D.8 Bowen Gas Project

South-eastern Long-eared Bat Core Habitat Possible

Date: 26/04/2018

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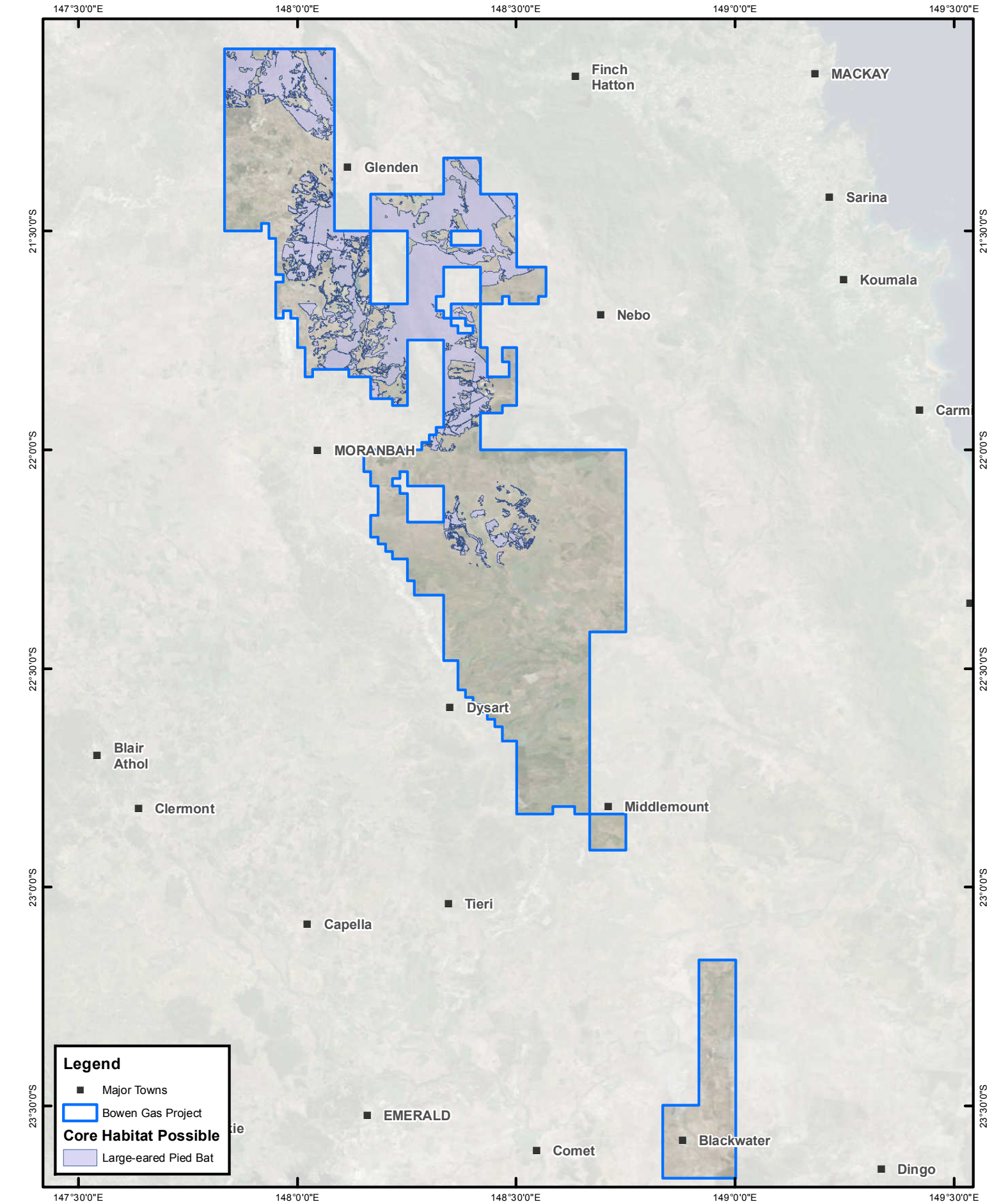

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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km

Figure D.9 Bowen Gas Project

Large-eared Pied Bat
Core Habitat Possible

Date: 30/04/2018

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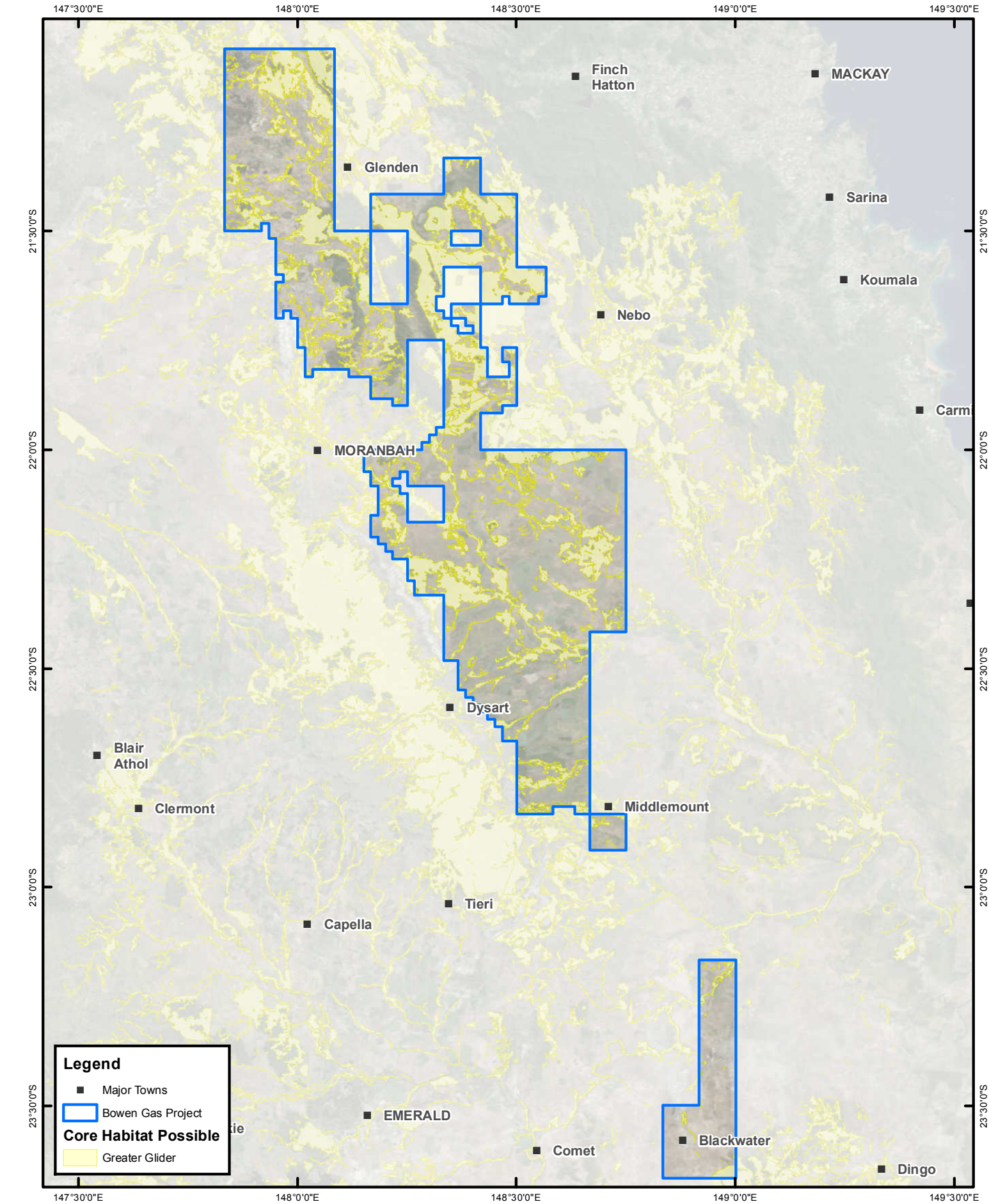

Source:
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Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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Figure D.10 Bowen Gas Project

Greater Glider
Core Habitat Possible

Date: 26/04/2018

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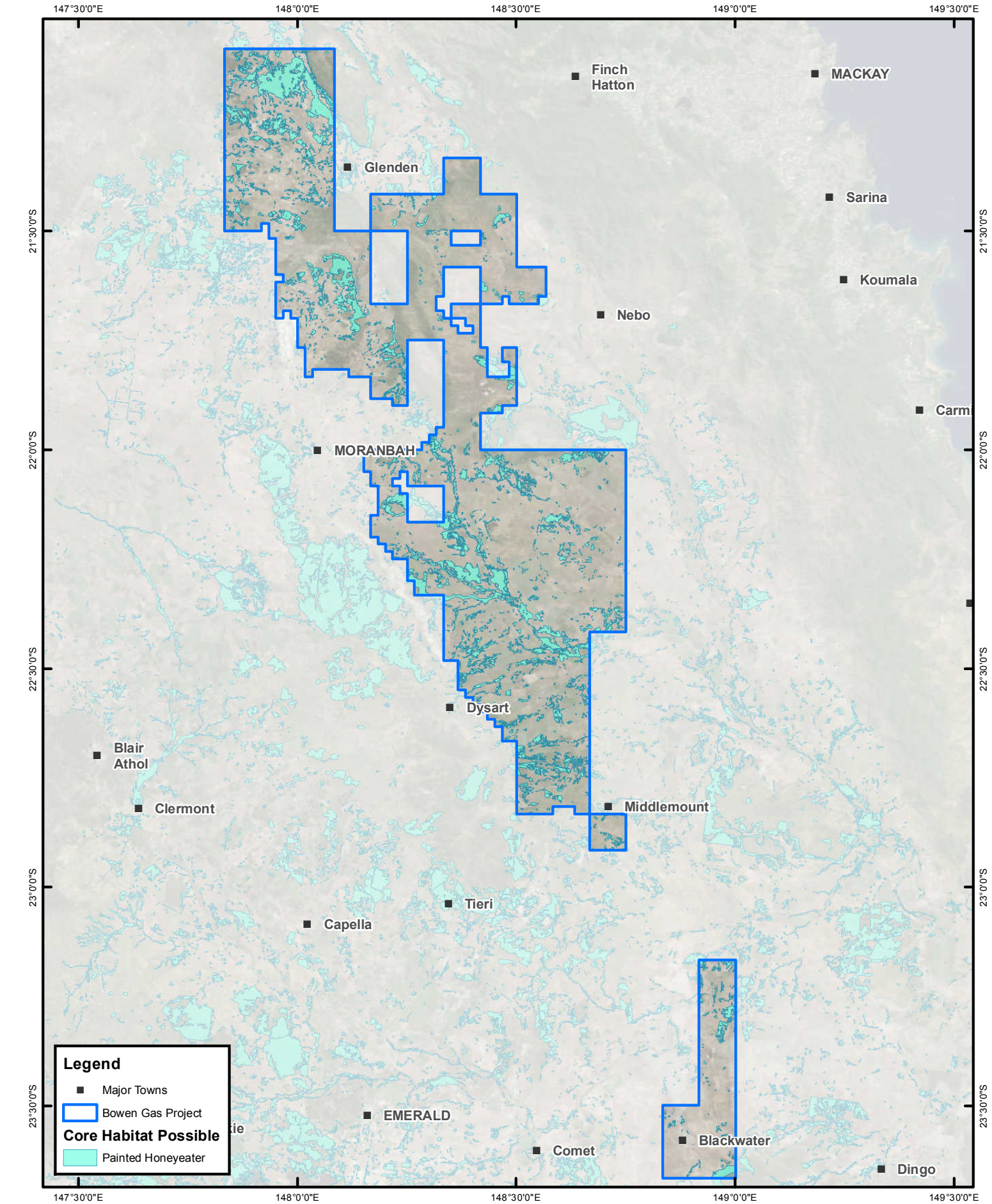

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

Figure D.11 Bowen Gas Project

Painted Honeyeater
Core Habitat Possible

Date: 26/04/2018

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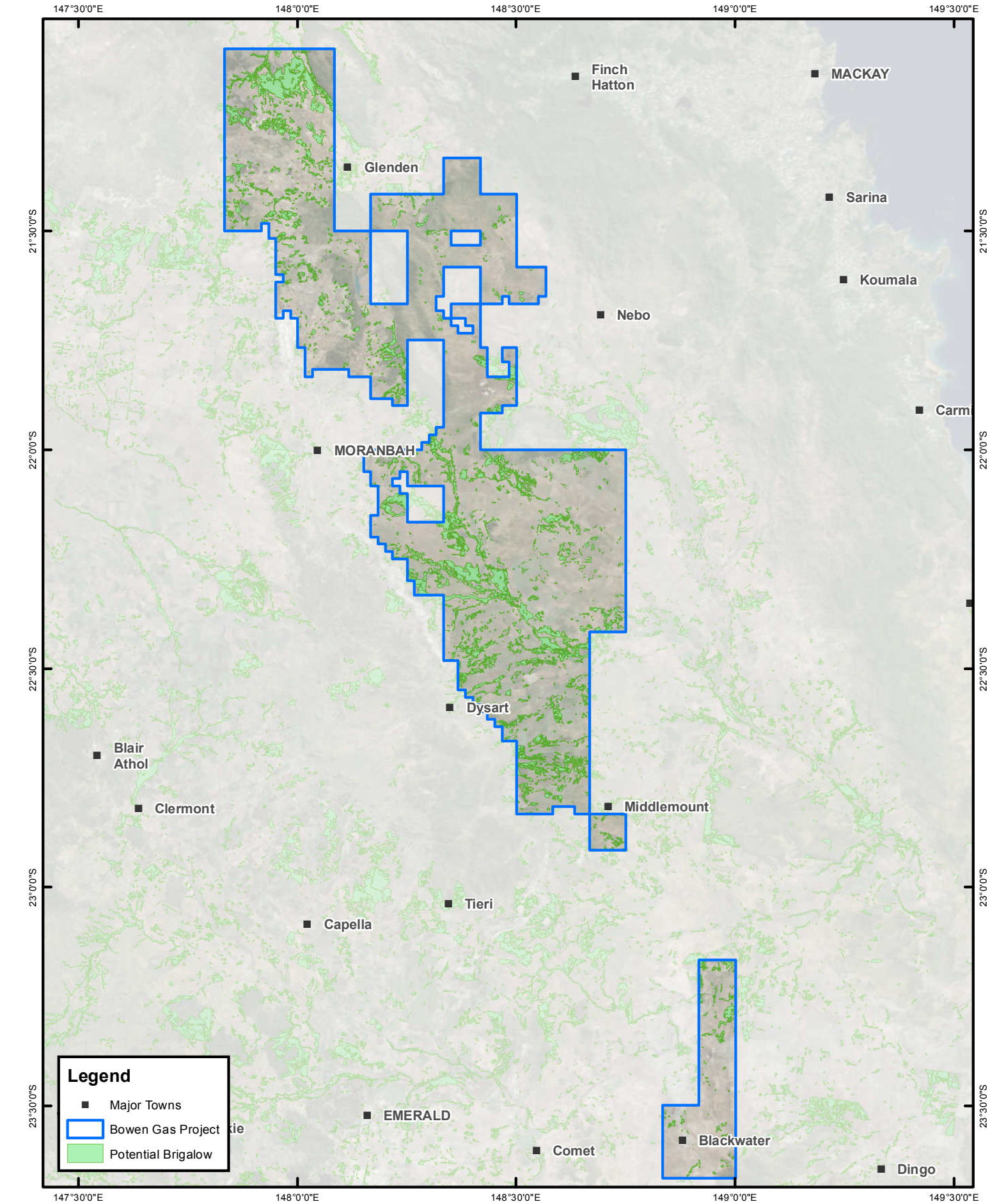

Figure D.12 Bowen Gas Project

Potential Brigalow TEC

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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Date: 30/04/2018

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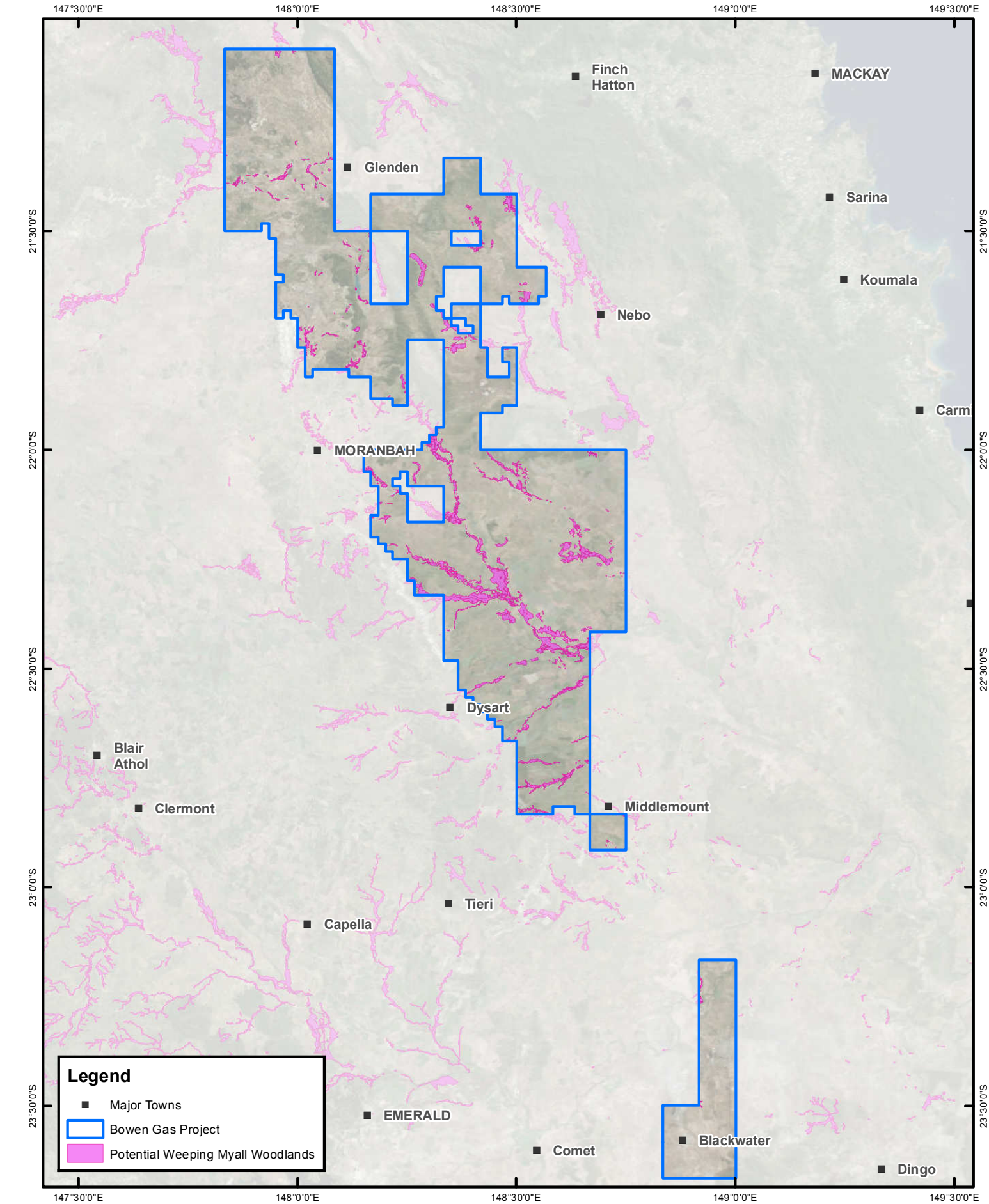

Figure D.13 Bowen Gas Project

Potential Weeping Myall Woodlands TEC

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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Date: 30/04/2018

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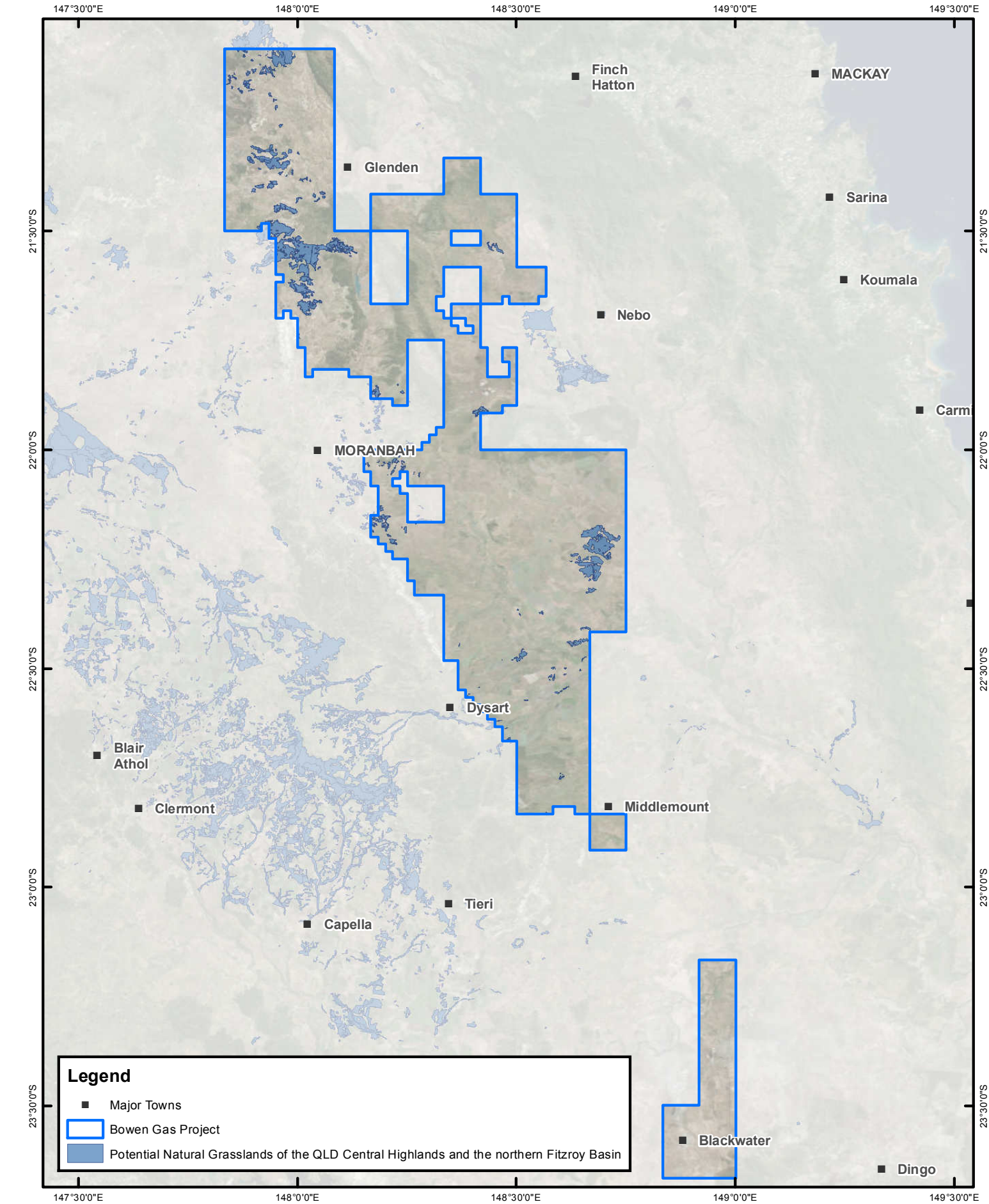

Figure D.14 Bowen Gas Project

Potential
Natural Grasslands of the QLD Central Highlands and the northern Fitzroy Basin TEC

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

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Coordinate System: GCS GDA 1994

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km

Date: 30/04/2018

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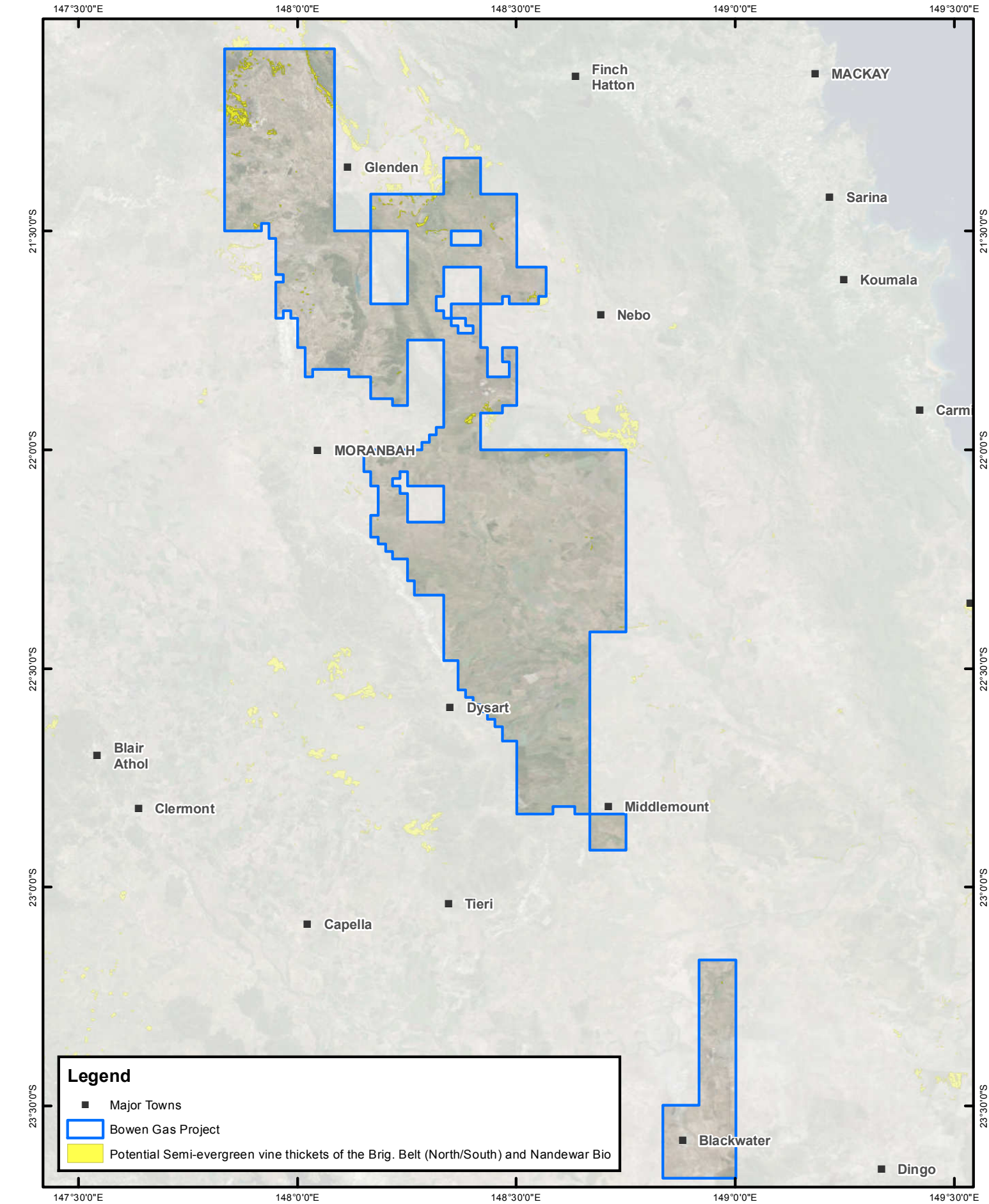

Figure D.15 Bowen Gas Project

Potential
Semi-evergreen vine thickets of the Brig. Belt (North/South) and Nandewar Bio TEC

Source:
Arrow Energy Limited, Geosciences Australia
Dept. Envir. and Resource Mgmt.

N

Coordinate System: GCS GDA 1994

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km

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Date: 30/04/2018

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