Matters of National Environmental Significance: Ecological Assessment Report

Comet Ridge Limited
Mahalo North Project: MNES EAR
Comet Ridge
BAA220014.01
19 November 2024

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

DOCUMENT CONTROL

Revision	Revision date	Revision details	Author	Editorial review	Technical review	Approver
Rev A	26/07/2024	Draft for Internal Review	B Taylor O Robertson	Y Suen	R Nejad	R Nejad

DISTRIBUTION

Revision	Revision date	Issued to
A	26/07/2024	Comet Ridge
0	19/11/2024	Comet Ridge
1	29/08/2025	Comet Ridge

DOCUMENT INFORMATION

Printed:	2 September 2025
Last saved:	27 June 2023
File name:	BAA220014.01_CometRidge_MahaloNorth_MNES_EAR_Rev0.docx
Author:	Oliver Robertson and Brett Taylor
Project manager:	Romin Nejad
Client:	Comet Ridge Limited
Document title:	Matters of National Environmental Significance: Ecological Assessment Report
Project number:	BAA220014.01

EXECUTIVE SUMMARY

Comet Ridge Mahalo North Pty Ltd (Comet Ridge) is proposing to develop a greenfield Coal Seam Gas (CSG) project contained within ATP2048 (the Project). The Project area is situated in Central Queensland approximately 45 kilometres (km) north of Rolleston and lies within the Central Highlands Regional Council area. The Project will require the development of 68 coal seam gas wells, gas gathering pipelines, a gas compression facility (GCF), and new access tracks. At this stage of the Project the location of the export pipeline alignment is still under investigation. Therefore, the export pipeline is excluded from this assessment.

The Project is located within the Brigalow Belt North Bioregion (BBNB). Within the BBNB the Project area lies within the Isaac-Comet Downs subregions. The overall Study area (which represents 45 subblocks within ATP2048) covers 14,084 hectares (ha), of which the majority (over 85 percent) (%) has been cleared for cattle grazing and cropping. Remnant vegetation is located largely in the northern section of the Study area on Togara property. Topography is relatively flat undulating downs, descending from the higher alluvial areas on the eastern boundary to the alluvial flats associated with the Comet River. The Project is located within the Comet River catchment which is part of the Fitzroy River Basin.

Desktop review and field surveys (carried out in 2022, 2023 and 2024) were carried out to characterise the terrestrial ecological values associated with the Project and immediate surrounds. The desktop review identified the potential presence of eight flora species and 30 fauna species listed as threatened under the *Nature Conservation Act 1992* (NC Act) and/or *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) as potentially occurring within the Study area and surrounds. A further 12 species listed as Migratory (under the EPBC Act) and Special Least Concern (SLC) (under the NC Act) were also predicted to occur. Other environmental values predicted to be present and listed as MSES include endangered regulated vegetation (under the *Vegetation Management Act 1999* (VM Act)) and protected wildlife habitat.

The flora survey identified 13 Regional Ecosystems (REs) within the Study area based on site surveys and analysis of aerial imagery. There are six REs comprising Brigalow communities listed as Endangered under the Queensland *Environmental Protection Act 1994* (EP Act) present. The majority of vegetation is listed as No Concern under the EP Act. There are substantial differences with the current State Government RE mapping which overstates the potential extent of Brigalow communities present within the Study area. The EPBC Act listed Brigalow TEC is considered present as scattered patches throughout the Study area. A single small patch of SEVT TEC occurs in the south-east corner of the Study area. No threatened flora species listed under the EPBC Act have been recorded during Project surveys, or other surveys carried out within the Study area. Nevertheless, one species is considered likely to be present: Annual Wiregrass (*Aristida annua*) (Vulnerable - EPBC Act and NC Act). One other threatened flora species has some potential to occur.

State mapping for threatened fauna species indicates there is habitat for Ornamental Snake (*Denisonia maculata*) (Vulnerable – EPBC Act and NC Act) within the Study area. No threatened or migratory species were recorded during site surveys for the Project. Short-beaked echidna (*Tachyglossus aculeatus*) is listed as SLC under the NC Act and was recorded during the Project surveys. Ornamental Snake has been recorded to the east and south-east of the Study area and is considered likely to occur based on the presence of suitable gilgai habitat, although targeted trapping during ideal conditions did not record the species. Koala (*Phascolarctos cinereus*) is also considered likely to occur based on older database records located within the Study area and the presence of suitable habitat. The Project area provides possible habitat for a further six threatened species and four migratory bird species.

In general, impacts resulting from Project activities will be minor and likely restricted to the construction phase. The location of Project infrastructure has been substantially revised and located away from sensitive ecological values as much as is feasible. The current Project layout of gas field infrastructure requires disturbance (vegetation clearing) of a maximum of 178.27 ha the majority of which is located in lands cleared for cattle grazing. The Project disturbance footprint has been refined to minimise impact on ecological values and is predicted to impact only 1.17 ha of remnant Poplar Box woodland (No concern under the EP Act) and 0.11 ha of remnant Queensland Blue Gum open forest (Of concern under the EP Act) through vegetation clearing. Impacts on the Queensland Blue Gum habitat will be minimised through the application of directional drilling for pipeline installation. The Project will also impact 0.89 ha of cleared habitat comprising gilgais which

may provide potential habitat for threatened species (Ornamental Snake in particular). The majority of the clearing impact will be restricted to narrow linear areas associated with the gathering flow line construction disturbance and clearing for well pads. Any potential indirect impacts to adjacent fauna/flora habitat from the Project are expected to be minimised through a range of mitigation measures applied under the project Construction Environmental Management Plan (CEMP) and Operational environmental Management Plan (OEMP).

The Project's impacts to Environmental Values were subject to a risk assessment analysis and assessment for significant impacts under State and Commonwealth guidelines. The Project was assessed as avoiding the potential to cause significant residual impacts (SRI) to any Matters of National Environmental Significance (MNES) or Matters of State Environmental Significance (MSES) identified as potentially occurring in the Study area.

1 INTRODUCTON

This Matters of National Environmental Significance: Ecological Assessment Report (EAR) has been prepared on behalf of Comet Ridge Mahalo North Pty Ltd (Comet Ridge) to support the legislated environmental approvals process for a greenfield coal seam gas (CSG) project (the Project) contained within Authority to Prospect 2048 (ATP2048). The CSG area is approximately 141 square kilometres (km^2) in size and will comprise a maximum of 68 CSG wells (34 CSG production wells and 34 lateral wells).

1.1 Project Location

The Project gas field area is confined to ATP2048 (14,084 hectares) (ha), which represents 45 sub-blocks which are denoted as the Study area for the purposes of this report. At this stage of the Project the location of the export pipeline alignment is still under investigation. Therefore, the export pipeline is excluded from this assessment. The Project area is situated in Central Queensland approximately 45 kilometres (km) north of Rolleston and lies within the Central Highlands Regional Council area. The far eastern portion of the Study area is intersected by Comet-Rolleston Road, which runs in a north-south direction (refer **Figure 1**).

1.2 Scope and Purpose of Assessment

The purpose of the ecological assessment is to document the baseline terrestrial ecological values of the Project area and provide avoidance, mitigation and management measures to adequately address impacts associated with the Project.

The description of baseline ecological values has been documented to support a Project referral to the Commonwealth Department of Climate Change, Energy, Environment and Water (DCCEEW) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Epic was engaged by Comet Ridge to undertake terrestrial ecological surveys for the Project. The scope of this report includes a description of the terrestrial fauna and flora species and habitats within the Study area. The assessment includes an analysis under relevant Commonwealth guidelines of the potential for significant residual impacts (SRI) to the following:

- Matters of National Environmental Significance (MNES) as listed under the EPBC Act such as threatened species (including habitat) and vegetation communities. The Study area also represents the 'proposed action area' associated with the submission of a referral of the Project under the EPBC Act.

The potential requirements for environmental offsets will be identified where SRIs are identified as likely occurring to identified environmental matters as a result of the Project's activities.

Figure 1. Project location

2 PROJECT DESCRIPTION AND ACTIVITIES

The Project involves the construction, operation, decommissioning, and rehabilitation of a CSG activity, including the following infrastructure components (refer **Figure 2**):

- 68 gas production wells
- Gas gathering pipelines
- Gas compression facility (GCF)
- New access tracks

2.1 Gas Production Wells

Surface to in-seam (SIS) gas wells will be constructed consisting of a horizontal well section drilled within the coal seam, that intersects the vertical gas well (the gas production well) (i.e. two wells will be required per production well). In some cases, only the horizontal SIS well will be drilled, and that will be the production well. Gas and water will be collected from the 34 gas production wells designed, constructed, and abandoned in accordance with the *Code of Practice for the construction and abandonment of coal seam gas and petroleum wells, and associated bores in Queensland*. The code outlines mandatory requirements and good practice for drilling and completion of gas wells to ensure long-term well integrity and protection of groundwater resources. Gas production wells for the Project do not require hydraulic stimulation.

Well sites will generally be constructed in an area of up to approximately 1 ha for the initial construction of the well. Following construction, well pads will be partially rehabilitated, with a fenced compound of 0.04 ha (20 m x 20 m) required for operational purposes and maintenance. Following drilling and completion, a pump will be installed within the gas production wells to reduce the hydrostatic pressure of the coal seam and facilitate gas production. The standard production well site will be fenced and generally include gas and water metering and separation equipment, electrical and control systems, particulate filter separator and manifolds to connect to water and gas pipelines.

Each production well will include the following equipment during operations:

- Well head
- Gas and water meter
- Gas and water separation equipment
- Electrical and control systems
- Particulate filter separator
- Manifolds to connect to water and gas gathering pipeline
- Fuel storage
- Mixed fuel generator (initially using diesel, then transferred to gas when the well is producing gas)
- Fence and gate

Each associated lateral gas well will be in a suspended well state, and will have cattle panels installed around the well head, of approximately 8 m x 8 m. No other plant or equipment will be installed at a suspended lateral well site.

Each well is expected to be operational for 12-15 years. Decommissioning of each well is proposed to be completed progressively as wells are depleted, plugged, and abandoned over the life of the project.

Decommissioning and rehabilitation of the gas wells once no longer operational would include:

- Vertical wells will be fully cemented back to surface from the bottom
- Lateral wells will be cemented from the bottom of the 7 inch casing back to the surface
- Removal of all plant, equipment, and fencing
- Restoration to pre-disturbance condition as per the rehabilitation requirements of the Project EMP

2.2 Ancillary Linear Infrastructure

Below-ground gathering pipelines will be constructed to collect gas and water from each production well. A construction disturbance area of 18 metres (m) wide will be required for standard pipeline construction

including trench excavation (up to 0.85 m wide), pipeline laying, backfilling the trench, and reinstatement of the disturbed area. Power lines and communication lines (e.g. fibre optic cable) may be co-located with pipelines. The construction disturbance area has been reduced to a width of 6 m where it intersects potential habitat for threatened species in order to minimise potential impacts. The majority of this disturbance will be temporary as the disturbed area will be restored to the former land use as soon as is practicable.

The gathering pipelines will intersect several mapped waterways. Installation of the gathering pipeline across these watercourses will be via open-cut trenching or horizontal directional drilling (HDD). The installation method will be determined with consideration to environmental constraints, geotechnical characteristics, and standard conditions at each proposed crossing location. For example, HDD will be used in the crossing of Humboldt Creek in order to avoid adjacent Brigalow vegetation. The construction of each crossing is expected to take approximately one week.

Decommissioning of gathering pipelines is proposed to be completed progressively as wells are depleted, plugged, and abandoned over the life of the project. This will also include the associated water, power and communications infrastructure.

Decommissioning and rehabilitation of the gathering lines would include:

- The gas and water gathering line will be purged
- Underground infrastructure will be made safe and remain in ground
- Each end of the line will be cut off below ground level
- Restored to pre-disturbance condition as per the requirements of the Project EMP

2.3 Gas Compression Facility

A GCF will be constructed to gather gas produced from the production wells and pressurise the gas for export to domestic markets. The GCF will be located within a fenced compound and include the following equipment during operations:

- Gas compression units (two in operation)
- Gas dehydration / separation units
- Associated instrumentation and control systems
- Water infrastructure, refer to **Section 2.3.1**
- Water tanks
- Safety systems
- Safety flare
- Site office
- Workshop
- Storage of fuel and chemicals[1]
- Vehicle washdown bay
- Potable water
- Vehicle parking (for up to 5 light vehicles)
- Accommodation camp (5 person capacity)
- Approximately 6 m wide internal access road

Sales gas from the compression facility would be transported through a licensed pipeline network. It is anticipated the GCF (including ancillary facilities) would require an area of 20 ha.

2.3.1 Water Management

A water treatment facility will be constructed to treat produced water to facilitate the beneficial use of water at a nominal treatment rate of up to 0.5 ML/day. The water treatment facility will include the following infrastructure:

[1] The maximum storage volume of fuels and chemicals on site will not exceed the ERA thresholds listed under s8(1), Schedule 2 of the EP Regulation

- A package water treatment plant
- Above ground lined ring tanks to store:
  - Produced water from the wells
  - Treated produced water
  - Brine
- Aboveground pipes to connect water treatment plant and the ring tanks
- Pumping equipment to facilitate the transfer of treated produced water for beneficial re-use

Brine from any treatment process will be stored in up to 100 ML of above-ground storages (e.g. lined ring tanks), constructed and operated in accordance with the manufacturers' specifications, from where it may be further concentrated via solar and mechanical evaporation to a concentrated slurry or solid salt. The concentrated waste product will be disposed of at a Regulated Waste Facility (RWF).

Water generated from the project may be beneficially used to support irrigation and industrial activities and development and operational activities (including drilling the wells and dust suppression). Water used for these purposes will comply with relevant standards, for example water used for irrigation will comply with Australian and New Zealand Environment and Conservation Council (ANZECC) guidelines for irrigation and the Queensland End of Waste Code (EOWC) requirements.

5.2.1.5 Decommissioning and Rehabilitation

Decommissioning and rehabilitation of the GCF would include:

- Removal of the plant and equipment
- Disposal of salts from the lined ring tanks
- Decompaction of the soil and returning it to its previous landform
- Rehabilitation of the site as per the requirements of the Project EMP

The GCF will be the last component of the Project to be decommissioned and rehabilitated as it is required to be operational throughout the entire life of the Project.

2.4 New Access Tracks

The majority of access tracks required for the Project will utilise existing access tracks. In areas where no access tracks exist, new tracks (6 m in width) will be established to allow access to project infrastructure. Based on the current project layout, the Project requires approximately 8 km of new access tracks to be established to access Project infrastructure.

Decommissioning and rehabilitation of access tracks is proposed to be completed progressively as project infrastructure is no longer required for operations, provided the access tracks are not required by the landholder. Rehabilitation of the access tracks will be as per the requirements of the Project EMP.

2.5 Workforce

2.5.1 Construction

The anticipated peak construction workforce numbers for the Project are provided in **Table 1.** The workforce for drilling of the wells will be housed in a temporary drilling camp located on each property where the wells are located. The workforce required for the construction of the GCF (which will be constructed prior to drilling activities), construction of access tracks and gathering network, will drive in from the local towns each day. Local towns may include but are not limited to Rolleston, Springsure, Comet and/or Emerald.

Drilling of the wells and construction of the gas and water gathering network may occur concurrently, the GCF and access tracks will be constructed prior, so that the maximum workforce at any one time may be up to 41 people.

Table 1. Anticipated workforce

Project component	Peak workforce numbers	Drive in, drive out (DIDO)
Drilling of the wells	35	Not required, workers will stay in temporary drill camp on site
Constructing access tracks	3	Yes, workers will drive from local towns
Constructing GCF	8	Yes, workers will drive from local towns
Constructing gathering network	6	Yes, workers will drive from local towns
Anticipated Total	**41**	

2.5.2 Operations

The anticipated peak operational workforce numbers are expected to be two personnel per day shift. Operators will be employed for scheduled maintenance, inspection activities and other routine tasks. Operating personnel will either drive to site each day from the local towns, or stay in the five person permanent camp located at the GCF for the duration of their shift. Telemetry will be installed on the wells and at the GCF, which mean that the site can also be monitored and operated remotely if required.

Figure 2. Project infrastructure layout

3 LEGISLATIVE CONTEXT

3.1 Commonwealth Legislation

3.1.1 Environment Protection and Biodiversity Conservation Act 1999

The Commonwealth EPBC Act is the key piece of Commonwealth legislation governing environmental protection in Australia. Administered by the Commonwealth DCCEEW, the EPBC Act defines and protects nine MNES including:

- World heritage properties
- National heritage places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth marine areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines)
- A water resource in relation to coal seam gas development and large coal mining development

Under Part 3 of the EPBC Act, a person must not undertake an action (e.g. a project, a development, an undertaking, an activity or a series of activities, or an alteration of any of these things) that will have, or is likely to have, a significant impact on a protected matter, without approval from the Minister.

If after all reasonable avoidance and mitigation measure have been taken, there is still a residual impact on a protected matter, an offset may be required where the impact is, or is likely to be, significant.

3.1.2 Environmental Offsets Policy 2012

The EPBC Act *Environmental Offsets Policy October 2012* (EOP) provides upfront guidance on the role of offsets in environmental impact assessments, and how the DCCEEW considers the suitability of a proposed offset. The EOP aims to improve environmental outcomes through the consistent application of best practice offset principles, provide more certainty and transparency, and encourage advanced planning of offsets.

3.2 Queensland State Legislation

3.2.1 Nature Conservation Act 1992

The *Nature Conservation Act 1992* (NC Act) regulates environmental impacts of development through the requirement for vegetation clearing permits, species management programs and other permits.

A clearing permit is required to clear protected plants unless an exemption applies. In general, clearing of Critically Endangered, Endangered, Vulnerable or Near Threatened protected plants will require a clearing permit. Clearing permit applications are assessed on a case-by-case basis and approvals will be subject to conditions.

Where activities involve tampering with 'animal breeding places', the tampering may be authorised by application to DES through an approved species management program.

3.2.2 Vegetation Management Act 1999

The *Vegetation Management Act 1999* (VM Act) regulates clearing of native vegetation in Queensland. The VM Act aims to conserve Queensland's biodiversity through vegetation management. The intent of the VM Act is to regulate the clearing of native vegetation in a way that:

- Conserves remnant vegetation
- Ensures clearing does not cause land degradation
- Prevents loss of biodiversity

- Maintains ecological processes
- Reduces greenhouse gas emissions
- Allows for sustainable land use

3.2.3 Environmental Offsets Act 2014

Under the *Environmental Offsets Act 2014* (Offsets Act) an environmental offset is defined as 'an activity undertaken to counterbalance a SRI of a prescribed activity on a PEM. PEMs are described as MSES and defined under Schedule 2 of the Offsets Regulation. Where a SRI is assessed as occurring on a PEM there may be a requirement for environmental offsets to compensate for the impact. The Queensland Environmental Offsets Policy Significant Residual Impact Guideline (QEOP Guideline) (DEHP 2014) provides the framework for assessing the potential for SRIs to MSES from a project's activities.

3.2.4 Biosecurity Act 2014

The *Biosecurity Act 2014* (Biosecurity Act) ensures a consistent, modern, risk-based and less prescriptive approach to biosecurity in Queensland. The Biosecurity Act provides comprehensive biosecurity measures to safeguard the economy, agricultural and tourism industries, environment and way of life from pests, diseases and contaminants. Decisions made under the Biosecurity Act will depend on the likelihood and consequences of risk, allowing for more appropriate management of risks.
Comet Ridge have a statutory duty of care ("general biosecurity obligation (GBO)") under the Act (s23). Under the GBO, Comet Ridge must:

- Take all reasonable and practical steps to prevent or minimise each biosecurity risk
- Minimise the likelihood of causing a 'biosecurity event', and limit the consequences if such an event is caused
- Prevent or minimise the harmful effects a risk could have, and not do anything that might make any harmful effects worse

Under the Biosecurity Act there are seven categories of 'restricted matter' with associated restrictions. Several categories may apply to a single 'restricted matter' and include the following (as relevant to the Project):

- Category 3: You must not distribute this restricted matter. This means it must not be given as a gift, sold, traded or released into the environment unless the distribution or disposal is authorised in a regulation or under a permit
- Category 4: You must not move this restricted matter to ensure that it does not spread into other areas of the State
- Category 5: You must not keep in your possession this category of restricted matter
- Category 6: You must not feed this category of restricted matter. Feeding for the purpose of preparing for or undertaking a control program is exempted

4 ASSESSMENT METHODS

The ecological assessment for the Project consisted of a desktop review of publicly available ecological data sources and information. The desktop review was followed by three seasonal field surveys carried out within the Project area to describe the ecological values present on the site and to aid the evaluation of the potential impacts of the Project to values considered important to MNES. A summary of the assessment methods is provided in the following sections.

4.1 Desktop Assessment

Prior to commencing the field survey, desktop assessments were carried out to identify species and ecological communities of conservation significance (both MNES and Matters of State Environmental Significance (MSES)) that potentially occur within the Project area. Flora and fauna values of conservation significance in this report refer to:

- Flora and fauna species listed as Critically Endangered, Endangered or Vulnerable under the EPBC Act and the NC Act
- Regional Ecosystems listed as Endangered or Of Concern under the EP Act
- Fauna species listed as Migratory under the EPBC Act due to their inclusion under one or more of the following:
  - Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
  - China-Australia Migratory Bird Agreement (CAMBA)
  - Japan-Australia Migratory Bird Agreement (JAMBA)
  - Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA)

The desktop assessment also aimed to identify other State-listed environmental values relevant to the site including Environmentally Sensitive Areas (ESAs) and MSES.

4.1.1 Data Sources

Flora and fauna records listed in publicly available databases and other resources were investigated to identify ecological matters relevant to the Study area. These resources included the following:

- DCCEEW Protected Matters Search Tool (PMST) (search based on 10 km buffer of the Study area) (**Appendix A**) (DCCEEW 2023 & 2024)
- Queensland Government Wildlife Online (WildNet) database (records within a 50 km radius around the point -24.0489, 148.6281) (**Appendix A**)
- Species Profile and Threats Database maintained by DCCEEW (DCCEEW 2024)
- Atlas of Living Australia (ALA), a web-based search tool that is a partnership between CSIRO, Australian museums, herbaria and other biological collections, and the Australian Government (ALA 2023)
- DES MSES mapping
- Department of Resources (DoR) Regulated Vegetation Management Map and Vegetation Management Supporting Map, including Regional Ecosystems (RE), essential habitat, watercourse and wetland mapping
- DES certified RE mapping (Version 13.01)

4.1.2 Previous Studies

There has been extensive ecological assessment work in the local area in recent years, some of which includes lands within or adjacent to the current Study area. Where considered relevant, the desktop assessment and discussion of field results within this assessment includes information from the following reports:

- *Mahalo Gas Project: Ecology technical report* (Golder 2018) – project encompassed lands to the immediate south and south-east of the current Study area

- *Blackwater terrestrial ecology survey report* (EMM 2022) – project encompassed lands within the eastern portion of the current Study area (on Togara property) as well as lands to the immediate east
- *Blackwater South terrestrial ecology survey report* (Epic 2024) – survey work encompassed lands within the north-eastern portion of Togara property within the Project area. Used to inform ground-truthed vegetation mapping where relevant.

4.2 Field Assessment Methods

4.2.1 Survey Timing and Conditions

Three rounds of field surveys were completed, including the following:

- A baseline flora and fauna assessment, including RE verification and threatened fauna habitat assessments from 4-7 April 2022
- A targeted threatened fauna survey including trapping and spotlighting from 30 January – 3 February 2023
- Follow up surveys to provide further confirmation of the extent of Threatened Ecological Communities (TECs) present in the Study area from 9-11 July and 26-30 August 2024

The nearest weather station providing continuous temperature and rainfall data is the Rolleston Airport station (approximately 41 km to the south). During the April 2022 survey temperatures ranged between 21.9°C and 38.9 degrees Celsius (°C). For the January-February 2023 survey, temperature ranged from a minimum of 21.4°C and a maximum of 36.2°C (BoM 2023). Patchy rain fell on the Study area during the survey period. The region recorded 269.2 millimetres (mm) of rainfall in the three months prior to the field survey, which is slightly more than the long-term average for this time period (248.5 mm). Over 135 mm was recorded in January prior to the 2023 survey (BoM 2023).

During the July 2024 survey temperatures ranged from a minimum of 7°C and a maximum of 25.7°C (BoM 2024). The region recorded 34.6 mm of rainfall in the two weeks prior to the field survey.

4.2.2 Limitations

In accordance with the *Terrestrial vertebrate fauna survey guidelines for Queensland* (Eyre et al. 2022) surveys in the Brigalow Belt Bioregion should be carried out in spring to early summer (September to mid-November) and autumn (March-mid-May). The 2022 survey was carried out in the autumn period. A survey planned to be carried out in November 2022 was cancelled due to the onset of heavy rains affecting site access. This survey was forced to be rescheduled to February 2023.

Site access during the surveys was restricted to two properties: Togara and Meroo Downs. Project infrastructure located outside the boundary of these properties has been assessed via desktop review only.

Survey planning considered relevant DCCEEW documents with regard to survey methods and intensity. It is noted these are not available for many species. A summary table outlining relevant species documentation and survey effort is presented in **Appendix C**.

4.2.3 Baseline Flora and Fauna Assessment – April 2022

Native vegetation within the Study area was assessed and mapped into analogous REs. The survey and mapping of REs was in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland V6.0* (Neldner et al. 2022). A combination of tertiary and quaternary RE sites were used to verify the on-ground vegetation communities present. Rapid assessments were carried out where simple confirmation of the RE present was considered based on the results of the more detailed quaternary assessments carried out elsewhere at the Study area.

Tertiary sites were used to identify REs with the quantification of vegetation community condition and floristic species composition. Twenty-seven tertiary sites were collected during the 2022 flora survey. At a minimum the following data were recorded at each quaternary survey site:

- RE type

- Vegetation condition
- Dominant, co-dominant, sub-dominant and associated flora species, median height and cover for each strata level
- Ecologically dominant layer (EDL)
- Structural classification (Specht & Specht 2000) (i.e. grassland, open-woodland, woodland etc.)
- Structure category (i.e. dense, mid-dense, sparse, very sparse)
- Landform
- Soil type
- Weed species and density
- Disturbance

Quaternary sites were used to ground-truth the extent, classification and condition of vegetation communities within the Project area. Twenty quaternary sites were collected during the 2022 flora survey. At each quaternary site the following data were recorded:

- RE type
- Condition (i.e. remnant, regrowth, non-remnant)
- Dominant flora species at each strata level
- EDL strata
- EDL cover and median height
- Structural classification (Specht & Specht 2000) (i.e. grassland, open-woodland, woodland etc)

Where REs were considered analogous to the Brigalow (*Acacia harpophylla* dominant and codominant) TEC (Brigalow TEC) the RE site data collected was compared with the key diagnostic characteristics and condition thresholds designating occurrences of the TEC, as detailed in the associated approved conservation advice (DE 2013a).

The flora survey site locations are shown in **Figure 9**. Site survey data and an overall list of flora species present within the Study area derived from the flora assessment are provided in **Appendix B**. General searches for threatened flora species derived from the desktop review were carried out where suitable habitat was observed at flora sites.

The fauna assessment comprised non-invasive methods and included the following:

- Bird surveys and habitat searches for herpetofauna at habitat assessment points
- Deployment of an Anabat Swift microbat call detector for two nights
- One night of spotlighting
- Opportunistic observations throughout the survey

Fauna habitat assessments were conducted at sites across the Study area to ascertain the quality and availability of habitat present for threatened species. Habitat assessments particularly identified values suitable for the potential presence of Ornamental Snake (*Denisonia maculata*) as detailed in the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPC 2011). Fifty-one assessment sites were collected during the 2022 and 2023 fauna surveys and assessed for the following features:

- Tree cover
- Ground cover
  - Grass cover
  - Bare ground
  - Non-native cover
- Presence of gilgais and cracking clay soils
- Rocky habtat
- Nearby water source
- Tree hollows
- Woody debris
- Level of cattle disturbance (lack of grass cover and surface soil trampling)

Habitat assessment data from the 2022 and 2023 surveys is collated in **Appendix C**. Assessment locations are depicted in **Figure 7.**

4.2.4 Targeted Threatened Fauna Survey – January-February 2023

The terrestrial fauna survey catalogued all species of terrestrial vertebrates recorded within and immediately adjacent to the project area with consideration of the methods described in the *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland* (Eyre et al. 2022). The recommended survey guidelines for Ornamental Snake were also considered in this methodology from the *Draft Referral guidelines for the nationally listed Brigalow Belt reptiles* (DSEWPC 2011).

A single, 2-person team fauna focussed survey led by a senior fauna ecologist carried out a five-day four-night trapping program and observations of fauna within the Study area during the January-February 2023 survey. The fauna survey focused particularly on Ornamental Snake which is listed as Vulnerable under the NC Act and EPBC Act. Survey conditions were considered highly suitable for detecting Ornamental Snake. There were very warm overnight temperatures with high humidity and some rainy periods, numerous scattered waterholes within the Study area, and frogs were active. Nevertheless, all terrestrial vertebrate fauna species present were documented. The trapping methods are described in **Table 2.** Trap locations are depicted in **Figure 7**.

Table 2. Project fauna trapping methods

Survey Method	Description	Target Taxa/Species
Elliot trapping	At each trap site, 25 Type-A Elliott Traps were placed 20-25 m apart and baited with a mix of peanut butter, oats, oil and honey. Traps were checked early in the morning. Two sets of traps were left out for four nights and a third site was left out for three nights. Total of 275 trap nights.	Small mammals
Funnel trap lines	Four pairs of funnel traps were placed per trap site. Funnel traps were arranged in two parallel lines either side of a 20-30 m long drift fence. All sites were placed in close vicinity to an adjacent waterhole on dark clay soils with scattered regrowth Brigalow present. Shade cloths were placed over each funnel trap to protect trapped animals during the day. Traps were operational for four nights at two survey sites and three nights at a further two sites. Traps were checked and cleared each morning and late afternoon. Total of 112 trap nights.	Frogs, snakes, other small-medium sized reptiles – in particular targeting Ornamental Snake
Spotlighting	Spotlighting was undertaken along vehicle tracks and where waterbodies were accessible (targeting Ornamental Snake). Approximately eight person hours of spotlighting was carried out within the Study area boundary across the 2022 and 2023 surveys.	Nocturnal fauna including arboreal mammals and herpetofauna
Habitat searches for herpetofauna	Inspections of potential shelter sites (e.g. fallen timber, debris, rocks, leaf litter) were carried out during the day to search for additional species (largely herpetofauna) not recorded using other survey techniques.	All herpetofauna
Bird surveys	Bird species were recorded at each systematic site during daily visits to check traps. Birds were identified by sight or call. An area with an approximate radius of 100 m around each trap-line was included in these bird censuses. At least two hours of survey effort was devoted to each trap site across survey period. Additional surveys (20 minutes over 2 ha) carried out at habitat assessment sites in 2022 and 2023. Approximately 22 hours of survey effort across 2022 and 2023 survey periods.	
Opportunistic records	Searches were carried out opportunistically throughout the survey and included some records located outside the immediate boundary of the Study area.	All fauna

4.2.5 TEC and RE Assessment – July/August 2024

The additional July and August 2024 assessments were focused on the occurrence and extent of TECs within the Study area, primarily occurrences of the Brigalow (*Acacia harpophylla* dominant and codominant) TEC (Brigalow TEC) and Poplar Box grassy woodland TEC. The assessments utilised quaternary RE sites as per Neldner et al. (2023) (as detailed in **Section 4.2.3**) to verify the vegetation communities present. BioCondition sites were used to collect structural and floristic data and were undertaken in accordance with the Queensland Herbarium *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland,*

*Assessment Manual, Version 2.2 (*Eyre et al. 2015). Potential Brigalow TEC site data was compared with the key diagnostic characteristics and condition thresholds designating occurrences of the Brigalow TEC as detailed in the associated approved conservation advice (DE 2013a). No potential occurrences of Poplar Box grassy woodland TEC were observed. The assessments comprised six BioCondition assessments and six quaternary assessments.

The flora survey site locations are shown in **Figure 9** and site data sheets are provided in **Appendix B**.

4.2.6 Suitably Qualified Personnel

The 2022 and 2023 surveys were led by Associate Environmental Scientist, Brett Taylor. The 2022 and 2024 flora surveys were carried out by Senior Environmental Scientist, Dr Oliver Robertson and Dave Stanton of WaterMark EcoHydrology.

Brett Taylor

Brett completed his Honours (1st Class) degree (BSc in Ecology and Conservation Biology) in 2006 and has extensive fauna survey experience in Queensland, New South Wales and Papua New Guinea. Brett has conducted fauna work in habitats throughout Queensland for over 14 years. This includes using targeted survey techniques for a variety of conservation significant fauna. He has substantial experience carrying out ecological impact assessments and EPBC Act referrals. He has participated as a fauna expert on the expert panel review of the Biodiversity Planning Assessment for the North-west Highlands Bioregion in 2019.

Dr Oliver Robertson

Oliver holds a PhD in Ecology from the University of Queensland, as well as a Bachelor of Environmental Science and a Bachelor of Science (Zoology) from Deakin University and the University of Melbourne, respectively.

With almost 9 years in the industry, Oliver has extensive experience in undertaking surveys for listed weeds and threatened fauna and flora species as part of environmental monitoring and compliance programs for projects throughout Queensland for a broad range of industries and government sectors, including road and rail transport, energy, communications and defence. He is familiar with environmental legislative requirements in Queensland and NSW. Oliver is suitably qualified to complete Protected Plant Flora Surveys under the Queensland Department of Environment and Science Protected Plants Flora Survey Guidelines (DES 2020).

4.2.7 Permits and Ethics Approvals

The field surveys were conducted in accordance with the following Queensland government permits and approvals:

- Scientific Use Registration Certificate (Department of Agriculture and Fisheries) – Registration No. SUR001535)
- Animal Ethics Approval (Department of Agriculture and Fisheries) – (Reference No. CA 2023/07/1743)
- Research Permit (DES) – Permit No. WA0027840

4.3 Likelihood of Occurrence Assessment

Following the field survey, a likelihood of occurrence assessment was completed to categorise the potential for threatened flora and fauna to occur based on the habitat observed within the Project area and surrounds (refer **Section 6.1.5** and **6.2.3**). The assessment provides the following criteria:

- Known to occur
  - Observed onsite during surveys
- Likely to occur
  - Observed close to site during surveys and suitable habitat occurs within site, or
  - Database records occurring close to site (within 10 km) and suitable habitat occurs within site
- Potential to occur

  - Database records occurring in wider area (>10 km and <50 km) and suitable habitat occurs within the site, or
  - Database records occurring close to site (within 10 km) and marginally suitable habitat occurs although remain relatively isolated (due to vegetation clearing)
- Unlikely to occur
  - No database records in wider area and/or
  - Habitat present in generally unsuitable and/or
  - Site generally outside of known distribution of species

4.4 Nomenclature and Taxonomy

The common names of many flora and fauna species frequently vary between regions, and many species lack them altogether. Taxonomy of flora presented in this report follows that currently endorsed by the Queensland Herbarium in the Census of Queensland Flora 2021 (Queensland Herbarium 2021a). The taxonomy of fauna follows the Australian Faunal Directory (ABRS 2023). In this report, flora and fauna species are referred to initially by both their common and scientific names and then for ease of reading, only by their common name (where the species has a common name).

5 DESKTOP ASSESSMENT RESULTS

5.1 Existing Environment

The Project is located within the Brigalow Belt North Bioregion (BBNB). Within the BBNB the Project area lies within the Isaac-Comet Downs subregions. Large areas of the Brigalow Belt have been cleared of remnant native vegetation for grazing, agriculture and mining. Remaining vegetation is often confined to rockier hilly areas, linear strips of roadside vegetation, riparian vegetation and relatively small, isolated pockets of remnant vegetation.

The overall Project encompasses approximately 14,084 ha. The majority of this area has been cleared for domestic livestock grazing. Extant tracts of vegetation communities remain disturbed to some degree (previous tree clearing and existing cattle grazing) and largely occur in the north and north-east of the Study area and along the Comet River to the west of the Study area. Lands subject to clearing occur in all directions surrounding the Study area. Lands to the west of the Comet River appear subject to cropping. The remaining area comprises areas which have been subject to extensive disturbance including tree clearing and blade ploughing to discourage regrowth. The Study area contains agricultural infrastructure such as fencing, water storage dams, cattle yards and unsealed tracks. Land to the north and northwest of the Project area has been substantially impacted by vegetation clearing associated with cattle grazing activity. The Comet-Rolleston Road intersects the far eastern portion of the Study area.

5.1.1 Topography, Geology and Soils

The Study area comprises grey self-mulching cracking clays and red massive earths on undulating plains. Topography descends in a relatively even manner from 240 m Australian Height Datum (AHD) at the eastern boundary of the Study area to 182 m AHD at the south-western boundary to the alluvial flats associated with the Comet River. The dominant geological substrate of the Study area is sedimentary rock associated with the Emerald Formation and alluvium associated with Humboldt Creek (refer **Table 3**). Isolated pockets of basalt occur adjacent to Humboldt Creek.

Table 3. Study area surface geology (QGlobe 2023)

Rock unit name	Lithological summary	Dominant rock	Age
Emerald formation	Deeply weathered fluviatile and lacustrine claystone and siltstone, quartzose sandstone, pebbly sandstone, gravel, lignite, oil shale, interbedded basalt	Sedimentary rock	Eocene
Qa-QLD	Clay, silt, sand and gravel; flood-plain alluvium	Alluvium	Quaternary
Tb-QLD	Mostly olivine basalt flows and some plugs; some areas of nephelinite, basanite	Basalt	Tertiary

5.1.2 Wetland and Watercourse Mapping

The Project is located within the Comet River catchment which is part of the Fitzroy River Basin. The overall Project area is intersected by 14 stream order 1 watercourses, one stream order 2 watercourses, one stream order 5 watercourse, and one stream order 6 watercourse. A wetland of high ecological significance (HES) and surrounding trigger area is mapped in the northern portion of the Study area (refer **Figure 3**). The only major watercourse associated with the Study area is Humboldt Creek which intersects the south-west corner. The Comet River is located adjacent to, but outside the western boundary of the Study area (QGlobe 2023).

Figure 3. Wetland and watercourse mapping for Study area

5.2 Matters of National Environmental Significance

The DCCEEW Protected Matters Report (PMR) identifies MNES protected under the EPBC Act considered as potentially occurring within the Study area and surrounds. The PMR identified three categories of MNES potentially present (as summarised in **Table 4**). A copy of the PMR is provided in **Appendix A**.

Table 4. EPBC Act PMR summary

MNES	PMR search result and relevance to Project
World heritage properties	Not applicable
National heritage places	Not applicable
Wetlands of International Importance	Not applicable
Great Barrier Reef Marine Park	Not applicable
Commonwealth Marine Area	Not applicable
Listed Threatened Ecological Communities (TECs)	Five TECs predicted to be present (refer **Section 5.3.2** for further information)
Listed threatened species:	Thirty species listed as threatened predicted to be present including eight flora species and 22 fauna species (refer **Section 6.1.5** and **Section 6.2.3** for further information)
Listed migratory species	Nine species listed as migratory predicted to be present (refer **Section 6.2.3** for further information)

5.3 Flora

5.3.1 Vegetation Communities

The overall Study area encompasses 14,084.7 ha. Current Queensland regulated vegetation mapping indicates the majority of the Study area is considered as Category X (Non-remnant) vegetation under the Queensland VM Act. Areas in the centre and northern extents of the Study area are mapped as Category B (Remnant) and Category C (High-value Regrowth). The extents of this mapping are detailed in **Table 5**. Current DoR vegetation community mapping identifies 14 REs within the Study area mapped as a mix of homogeneous and heterogenous polygons. The REs are briefly described in **Table 6** and depicted in **Figure 4** including their relevance to TECs listed under the EPBC Act).

Table 5. Regulated vegetation mapped within the Study area

Regulated Vegetation category	Extent (ha)
Category B (Remnant)	2,080.65
Category C (High-value Regrowth)	172.79
Category X (Non-remnant)	11,831.26

Table 6. Regional ecosystems currently mapped within Study area

RE	Short description (Queensland Herbarium 2023)	VM Act Status	Potential TEC	Condition	Extent (ha)
11.3.1	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	Endangered	Brigalow	Remnant	0.57
				Regrowth	0.12
11.3.2	*Eucalyptus populnea* woodland to open woodland on Cainozoic alluvial plains	Of concern	Poplar Box woodland	Regrowth	1.68
11.3.3	*Eucalyptus coolabah* woodland on alluvial plains	Of concern	-	Remnant	0.24
				Regrowth	0.05
11.3.25	*Eucalyptus tereticornis* woodland to open forest on fringing levees and banks of major rivers and drainage lines	Least Concern	-	Regrowth	0.30
11.4.8		Endangered	Brigalow	Remnant	92.97

RE	Short description (Queensland Herbarium 2023)	VM Act Status	Potential TEC	Condition	Extent (ha)
	Eucalyptus cambageana woodland to open forest with *Acacia harpophylla* or *A. argyrodendron* on Cainozoic clay plains			Regrowth	16.82
11.4.9	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains	Endangered	Brigalow	Remnant	116.59
				Regrowth	4.26
11.4.9a	*Acacia harpophylla, Lysiphyllum carronii +/- Casuarina cristata* open forest to woodland. Not a Wetland	Endangered	Brigalow	Remnant	22.91
11.5.2	*Eucalyptus crebra*, *Corymbia* spp., with *E. moluccana* woodland on lower slopes of Cainozoic sand plains and/or remnant surfaces	Least Concern	-	Remnant	130.97
				Regrowth	0.44
11.5.3	*Eucalyptus populnea +/- E. melanophloia +/- Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces	Least Concern	-	Remnant	1,468.05
				Regrowth	140.57
11.5.9b	*Eucalyptus crebra, E. tenuipes, Lysicarpus angustifolius +/- Corymbia spp.* Woodland. Not a Wetland	Least concern	-	Remnant	56.13
				Regrowth	0.19
11.5.16	*Acacia harpophylla* and/or *Casuarina cristata* open forest in depressions on Cainozoic sand plains and remnant surfaces	Endangered	Brigalow	Remnant	181.25
				Regrowth	9.99
11.7.2	*Acacia spp.* Woodland on Cainozoic lateritic duricrust. Scarp retreat zone	Least concern	-	Remnant	7.30
11.8.4	*Eucalyptus melanophloia* woodland to open woodland on Cainozoic igneous rocks.	Least concern	-	Remnant	1.92
				Regrowth	0.05
11.8.5	*Eucalyptus orgadophila* open woodland on Cainozoic igneous rocks	Least concern	-	Remnant	0.13
11.8.11	*Grassland* dominated by *Dichanthium sericeum, Aristida spp., Astrebla* spp. and *Panicum decompositum* on undulating to gently undulating rises.	Of Concern	Natural Grasslands	Remnant	0.13
Non-remnant	-	-	-		11,831.26

5.3.2 Threatened Ecological Communities

The PMST report identifies the following five TECs as possibly present with the Study area:

- Brigalow (*Acacia harpophylla* dominant and co-dominant) (Brigalow TEC)
- Natural Grasslands of the Queensland Central Highlands and northern Fitzroy Basin (Natural Grasslands TEC)
- Poplar Box Grassy Woodland on Alluvial Plains (Poplar Box TEC)
- Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions (SEVT TEC)
- Weeping Myall Woodlands

There are five REs mapped as present throughout the Study area which are considered analogous to the Brigalow TEC: RE 11.3.1, 11.4.8, 11.4.9, 11.4.9a and 11.5.16 (refer **Table 6** and **Figure 4**). These occur as remnant and regrowth RE polygons and includes single and mixed vegetation polygons where the RE analogous to the TEC comprises 10-30% of the overall area. The mapping indicates there is 445.48 ha of potential Brigalow TEC predicted to occur within the Study area.

There is one RE considered analogous to the Natural Grasslands TEC: 11.8.11. This RE is mapped across one remnant mixed vegetation polygon (1.73 ha in size) intersected by the southern boundary of the Study area. The mapping indicates 0.13 ha of potential Natural Grasslands TEC occurring within the Study area. Analysis of aerial imagery demonstrates the entire mapped area is wooded (i.e. is not a grassland).

There is one RE considered analogous to the Poplar Box TEC: 11.3.2. This RE is mapped across two regrowth mixed vegetation polygons (0.34 ha and 1.63 ha respectively) in the eastern portion of the Study area adjacent to Comet River Road. The mapping indicates 1.68 ha of potential Poplar Box TEC within the Study area. Analysis of aerial imagery demonstrates the larger polygon is intersected by the Comet River Road and entire mapped area and only 0.98 ha remains wooded.

There are several REs within the broader region surrounding the Study area which are also considered analogous to the Brigalow TEC: RE 11.3.1, 11.4.8, 11.4.9, 11.5.16, 11.9.1 and 11.9.5. **Figure 5** depicts the potential extent of Brigalow TEC within 20 km of the Study area as based on the current Queensland Government RE mapping. It is important to note that areas outside the Study area have not been field verified. Many of the areas shown are mapped as mixed vegetation polygons where as little as 10% of the polygon is estimated as potentially comprising Brigalow vegetation.

5.3.3 Conservation Significant Flora

The desktop review identified eight flora species listed as threatened under the NC Act and/or EPBC Act as potentially occurring within the wider area surrounding the site (refer **Appendix A** for database search results). The PMR predicted the potential presence of eight flora species listed as Vulnerable or Endangered under the EPBC Act and/or NC Act. The Wildlife Online search results identified one additional flora species listed as Vulnerable under the EPBC Act (refer to **Figure 6**).

- *Aristida annua* (Vulnerable – NC Act and EPBC Act) – One record (1993) located 6 km north of the Study area, two records (1971-1995) located south-west within 50 km of the Study area
- *Bertya opponens* (Least Concern – NC Act, Vulnerable – EPBC Act) – Seven records (1985-2019) located within 50 km north-east of the Study area. (1934-1999)
- *Cadellia pentastylis* (Vulnerable – NC Act and EPBC Act) – Two records (1991-1996) located 25 km northeast of the Study area. One record (2011) located 31 km south of the Study area
- *Dichanthium queenslandicum* (Vulnerable – NC Act, Endangered – EPBC Act) -17 records exist within 50 km of the Study area to the north, west and south-west
- *Dichanthium setosum* (Least Concern – NC Act, Vulnerable – EPBC Act) – Three records 35-50 km south west of the Study area from 2018
- *Leichhardtia brevifolia* (Vulnerable – EPBC Act) – Six records (1985-2004) located within 50 km east of the Study area (high uncertainty on the coordinate precision of the record location associated with a single 1990 record)
- *Polianthion minutiflorum* (Vulnerable – NC Act, Endangered – EPBC Act) – two records (2002 and 2003) located in Amaroo State Forest 25 km and 32 km north of the Study area
- *Solanum dissectum* (Endangered – NC Act and EPBC Act) – Four records (2010-2019) located within 40 km northeast of the Study area

Figure 4. Queensland Government mapped regional ecosystems and potential TECs

Figure 5. Potential Brigalow TEC areas mapped as occurring within 20 km of the Study area

Figure 6. Threatened MNES flora species records within 50 km radius of the Project

5.4 Conservation Significant Fauna

5.4.1 Habitat Mapping

Assessment of DES protected wildlife and essential habitat mapping for threatened fauna species (refer **Figure 7**) indicates there are areas located across Togara and to a lesser extent within Meroo Downs which are considered suitable for Ornamental Snake. Habitat along the Comet River to the west is also considered suitable for Ornamental Snake.

An area within Togara located to the immediate north of the Study area and is considered as habitat for Australian Painted Snipe (*Rostratula australis*). Based on the shape of this particular area it appears to be based on a previous record of the species, rather than habitats based on REs (as for Ornamental Snake).

5.4.2 Threatened Fauna Species Records

The desktop review identified 30 fauna species listed as threatened and 12 fauna species listed as migratory under the NC Act and/or EPBC Act as potentially occurring within the wider area surrounding the site (refer **Appendix A** for database search results). The PMR predicted the potential presence of 22 fauna species listed as Vulnerable or Endangered and nine species listed as migratory under the EPBC Act. The Wildlife Online search results identified three additional fauna species listed as migratory under the NC Act. Threatened species identified as occurring within 50 km of the Study area from the ALA (2023) database include the following (refer **Figure 8** for locations):

- Red Goshawk (*Erythrotriorchis radiatus*) (Vulnerable – EPBC Act) – Several records (1996-1998) located 41-51 km northeast of the Study area. Scattered records in the wider region surrounding the Study area but all are older (pre 1981)
- Australian Painted Snipe (Endangered – EPBC Act) – Two undated Birdlife Australia records located 38 km and 47 km west of the Study area
- Squatter Pigeon (southern) (*Geophaps scripta scripta*) (Vulnerable – EPBC Act) - Two records undated Birdlife Australia records located 15 km and 24 km north of the Study area (high uncertainty on the coordinate precision of the record location associated with these records)
- Grey Falcon (*Falco hypoleucos*) (Vulnerable – EPBC Act) – Sparse records scattered in the wider area surrounding the Study area. Nearest record located 41 km east of the Study area. All of these records are older (pre 1981)
- Painted Honeyeater (*Grantiella picta*) (Vulnerable – EPBC Act) – Two records (1985-2017) located 38 km and 48 km north-east of the Study area
- Diamond Firetail (*Stagonopleura guttata*) (Vulnerable – EPBC Act) – one record located 45 km west and three records from west of Rolleston (38-46 km south-southwest). All records are Birdlife Australia data and are older than 1982.
- Northern Quoll (*Dasyurus hallucatus*) (Endangered – EPBC Act) – Three records (1967-1975 and one undated) located 47 km west of the Study area. One record (1997) located 41 km south
- Greater Glider (*Petauroides volans*) (Endangered – EPBC Act) – Multiple records located northeast at least 38 km from the Study area. Closest records (1997) located 24 km south of the Study area. Several records (2012 and 2016) located south and west including relatively recent records near Springsure (48 km west)
- Koala (*Phascolarctos cinereus*) (Vulnerable – EPBC Act) – Large number of database records in wider area including two records (1976 and 1996) within the Study area itself. Most records are older (pre1990). Nearest recent record (2012) located 17 km south-east.
- Ornamental Snake (Vulnerable – EPBC Act) – Nearest database records located approximately 25 km to the north (1995) and 45 km to the north-west (1977). Recorded during surveys for other projects in the wider area (Golders 2019; EMM 2022). All sightings were located west of the Comet-Rolleston Road despite targeted surveys for the species within the east of the current Study area (EMM 2022) and to the immediate south (Golders 2019).
- Grey Snake (*Hemiaspis damelii*) (Endangered - EPBC Act) - One record (2003) located 39 km north of the Study area

Figure 7. Protected wildlife habitat, essential habitat mapping and fauna survey sites within Study area

Figure 8. Threatened fauna species records within 50 km radius of the Project

6 FIELD ASSESSMENT RESULTS

6.1 Flora Survey Results

6.1.1 Flora Diversity

A total of 123 flora species were identified within the site, including 14 non-native flora species. The floral assemblage is dominated by native grasses, herbs and woody shrubs. Tree species were comprised of Acacias, eucalypts and soft-wood scrub species. A full list of recorded flora species is provided in (refer **Appendix B**).

6.1.2 Ground-truthed Regional Ecosystems

A total of 27 tertiary RE sites, 26 quaternary RE sites and six BioCondition assessments were completed across the Study area for the Project (refer **Figure 9**). Vegetation community mapping in the north and far south-east of the Study area has been supplemented by data collected by EMM (2022) and Epic for nearby Projects (Epic 2024). A portion of the Study area in the north-east was not subject to ground-truthing as it was located away from Project infrastructure and not considered relevant to potential impact from the Project.

Ground-truthing vegetation surveys confirmed the presence of nine vegetation communities encompassing 13 RE types. There are substantial differences with the current State Government RE mapping which overstates the potential extent of Brigalow communities present within the Study area. The remaining area encompassed water bodies, and non-remnant areas impacted by vegetation clearing. The description, status and extent of each RE is provided in **Table 7** and depicted in **Figure 9**. Further detail regarding vegetation community floristics, structure and representative photos is provided in the following sections. Secondary and Quaternary RE assessment data is provided in **Appendix B**.

Table 7. Ground-truthed REs within Study area

Vegetation community	RE	Regulated vegetation category	TEC	EP Act (biodiversity) status	Extent within Study area (ha)
1. Remnant Brigalow woodland	11.3.1	B	Brigalow (*Acacia harpophylla* dominant and co-dominant)	Endangered	21.77
	11.4.8				84.80
	11.4.9				71.19
	11.4.9a				36.65
	11.5.16				0.82
2. Regrowth Brigalow woodland	11.4.7	C			13.27
	11.4.8				3.57
	11.4.9a				27.37
	11.3.1	C	N/A	Endangered	3.89
3. Remnant Acacia woodland	11.7.2	B	N/A	No concern at present	104.76
4. Remnant Poplar Box woodland	11.5.3	B	N/A	No concern at present	1,601.14
5. Regrowth Poplar Box woodland	11.5.3	C			72.83
6. Remnant Queensland Blue Gum open forest	11.3.25	B	N/A	Of concern	29.31
	11.3.4				2.42
7. Remnant Silver-leaved Ironbark woodland	11.5.9a	C	N/A	No concern	224.75
8. Remnant Mountain Coolibah woodland	11.8.5	C	N/A	No concern	27.43
9. Remnant semi-evergreen vine thicket	11.8.13	C	Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions	Endangered	1.02

6.1.3 Vegetation Community Descriptions

6.1.3.1 Remnant Brigalow Woodland

This vegetation community occurs on a variety of soil types including alluvium, clay plains and old loamy sandy plains. The structure of the community varies from woodland to open-woodland (refer **Plate 1**). The community is dominated by Brigalow (*Acacia harpophylla*) with co-dominant Dawson Gum (E*ucalyptus cambageana*) or associated Narrow-leaved Grey Box (*Eucalyptus woollsiana*) or Belah (*Casuarina cristata*). Scattered Queensland Bottle Tree (*Brachychiton rupestris*) occasionally occur as do emergent Coolabah (*Eucalyptus coolabah*) with a median height range of 10-17 m and a canopy cover range or 15-35 percent (%). A subcanopy typically occurs and is comprised of Brigalow, Wilga (*Geijera parviflora*), Paperbark (*Melaleuca decora*), Yellow-wood (*Terminalia oblongata* subsp. *oblongata*), False Sandalwood (*Eremophila mitchellii*) and Emu Apple (*Owenia acidula*),with a median height range of 5-11 m.

A mid-dense shrub layer always occurred and was comprised of Turkey Bush (*Eremophila deserti*), Curracabah Wattle (*Acacia crassa* subsp. *crassa*), Wilga, Boonaree (*Alectryon oleifolius* subsp. *canescens*), False Sandalwood, Slender Grape (*Clematicissus opaca*), Brigalow, Emu Apple, Dysentery Plant (*Grewia latifolia*), Currant Bush (*Carrissia ovata*) and Cocaine Bush (*Erythroxylum australe*). A secondary very low shrub layer also typically occurred and included Currant Bush, Curracabah Wattle, Slender Grape, Goathead Burr (*Sclerolaena bicornis*), Scrub Boonaree (*Alectryon diversifolius*) and *Salsola australis*.

Ground cover was sparse and dominated by annual and perennial tussock grasses with some forbs and sedges present. Ground cover species included Hairy Panic (*Panicum effusum*), Native Millett (*Panicum decompositum*), Spreading Umbrella Grass (*Digitaria divaricatissima*), Dark Wiregrass (*Aristida calycina*), Lignum (*Duma florulenta*), Annual Pigeon Grass (*Setaria surgens*), Bottle Washers (*Enneapogon avenaceus*), Purple Wiregrass (*Aristida ramosa*) and *Salsola australis*.

Non-native plant cover ranged from 5% to 70% and included Common Pest Pear (*Opuntia stricta*), Buffel Grass (*Cenchrus ciliaris*), African Lovegrass (*Eragrostis curvula*), Harrisia Cactus (*Harrisia martinii*) and Guinea Grass (*Megathyrsus maximus*). The vegetation community was subject to varying degrees of disturbance from cattle and feral animals, particularly Feral Goats and Feral Pigs. Gilgais were largely absent from the community, except for an area of RE 11.3.1 fringing a drainage line in the far western portion of the Study area and a block of RE 11.4.9 in south-west of Togara.

Plate 1. Remnant Brigalow woodland

6.1.3.2 Regrowth Brigalow Woodland

This regrowth vegetation community occurs on clay plain as low woodland (refer **Plate 2**). The community is dominated by Brigalow with associated Yellow-wood and Ebony Tree (*Lysiphyllum carronii*) with a median height of 5 m and a canopy cover of 15%. A very-sparse shrub layer was comprised of Wilga and Desert Lime (*Citrus glauca*). A secondary low shrub layer of Turkey Bush also occurred.

Ground cover was sparse and dominated by tussock grassed including Spreading Umbrella Grass, Native Millett, and Rats Tail Grass (*Sporobolus creber*). Forbs were also present to a lesser degree and included Hairy Joyweed (*Alternanthera nana*), High Sida (*Sida trichopoda*), Ruby Saltbush (*Enchylaena tomentosa*), Pin Sida (*Sida fibulifera*) and Sesbania Pea (*Sesbania cannabina*).

Non-native plant cover was estimated at 5% to 30% and included invasive grasses such as Rhodes Grass (*Chloris gayana*) and Sabi Grass (*Urochloa mosambicensis*). Examples of this vegetation community within the Study area included linear patches of roadside regrowth and larger areas subject to historical thinning and clearing. Analysis of historical imagery determined that clearing of the vegetation community occurred greater than 15 years ago.

Plate 2. Regrowth Brigalow woodland

6.1.3.3 Remnant Acacia woodland

There are a number of patches in the north-east of the Study area with a dense canopy cover of Lancewood (*Acacia shirleyi*) open forest on shallow red soils. The canopy includes occasional emergent Silver-leaved Ironbark (*Eucalyptus melanophloia*). There is an approximate canopy height of 10 m with a dense cover of 50-60%. The shrub layer is sparse and includes immature Lancewood and occasional *A. crassa* and *Denhamia* species.

Ground cover was patchy and dominated by annual and perennial tussock grasses and herbs including Hairy Panic, Dark Wiregrass, Many-headed Wiregrass (*Aristida caput-medusae*), Mulga Fern (*Cheilanthes sieberi*), Native Millett, High Sida and Pin Sida.

Non-native species were restricted to a patchy occurrence of Buffel Grass. The vegetation community was subject to less disturbance from cattle being less attractive for foraging.

6.1.3.4 Remnant Poplar Box Woodland

This vegetation community occurs on old loamy sandy plains. The structure of the community varies from woodland to open-woodland (refer **Plate 3**). The community is dominated by Poplar Box (*Eucalyptus populnea*) with associated Silver-leaved Ironbark, Brigalow, Dawson Gum, Long-fruited Bloodwood (*Corymbia clarksoniana*), Gidgee (*Acacia cambagei*), White Cypress Pine (*Callitris glaucophylla*), Queensland Bottle Tree and Budgeroo (*Lysicarpus angustifolium*), with a median height range of 10-30 m and a canopy cover range of 10-70%. A mid-dense sub-canopy typically occurs, including White Cypress Pine, Blackwood (*Acacia argyrodendron*), Yellow-wood, Brigalow, Queensland Bottle Tree, Gidgee, Quinine Tree (*Petalostigma pubescens*), Poplar Box, Leichardt Bean (*Cassia brewsteri*), Red Ash (*Alphitonia excelsa*), False Sandalwood, Myrtle Tree (*Canthium oleifolium*) and Supplejack (*Ventilago viminalis*), with a median height range of 5-8 m.

A mid-dense shrub layer always occurred and was comprised of Leichardt Bean, Curracabah Wattle, Wax Flower (*Philotheca difformis*), Wilga, Cocaine Bush, Black Wattle (*Acacia leiocalyx*), Quinine Tree, False Sandalwood, White Cypress Pine, Sandalwood (*Santalum lanceolatum*), Kurrajong (*Brachychiton populneus*), Gidgee, Acacia debilis and Peach Bush (*Ehretia membranifolia*).

A secondary very low shrub layer also typically occurred and included Currant Bush, Curracabah Wattle, Dysentery Plant and Wild Orange (*Capparis canescens*).

Ground cover was sparse and dominated by tussock grasses and annual herbs including Kangaroo Grass *(Themeda triandra*), Hairy Panic, Black Speargrass (*Heteropogon contortus*), Dark Wiregrass, Many-headed Wiregrass, Leafy Nineawn (*Enneapogon polyphyllus*), Native Millett, High Sida and Pin Sida.

Non-native plant cover ranged from 5% to 70% and included Common Pest Pear, Buffel Grass, Shrubby Stylo (*Stylosanthes scabra*) and Guinea Grass (*Megathyrsus maximus*). The vegetation community was subject to varying degrees of disturbance from cattle.

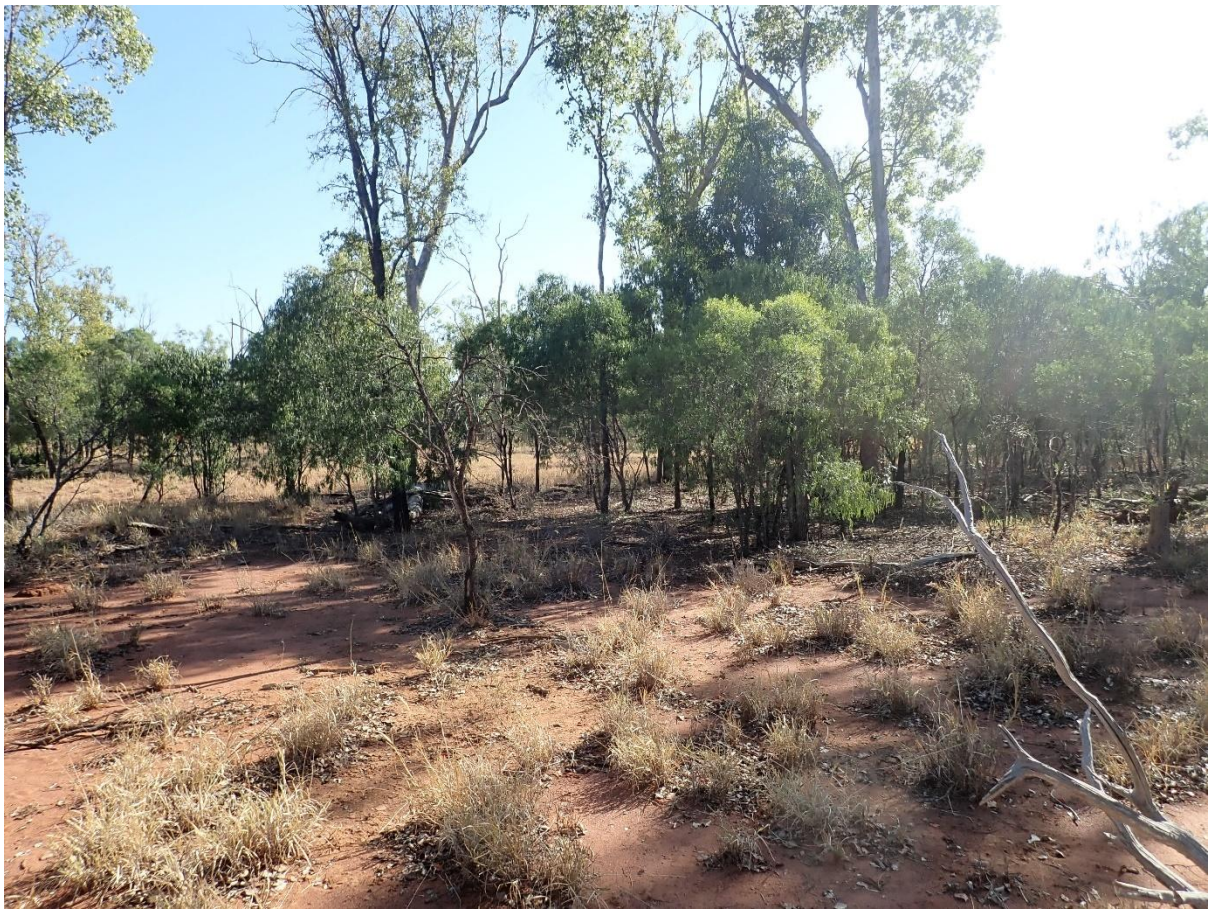


Plate 3. Remnant Poplar Box woodland

6.1.3.5 Regrowth Poplar Box Woodland

This regrowth vegetation community occurs on old loamy sandy plains in an open-woodland state (refer **Plate 4**). The community is dominated by Polar Box (*Eucalyptus populnea*) with associated Silver-leaved Ironbark and Dawson Gum with a median height range of 9-15 m and a canopy cover of 5%. A low and sparse sub-canopy was comprised of Quinine Tree, Red Ash and False Sandalwood with a median height of 5 m. A sparse shrub layer was comprised of Curracabah Wattle, Quinine Tree, Wilga, Cocaine Bush and Myrtle Tree with a median height range of 1-2.5 m.

Ground cover was sparse and dominated by tussock grasses and annual herbs including Black Speargrass, Golden Beard Grass (*Chrysopogon pallidus*), Native Millett, Hairy Panic, Comet Gras (*Perotis rara*),

Bottlewashers (*Enneapogon avenaceus*), High Sida, Pin Sida and Flaxweed (*Pimelea trichostachya*). Non-native plant cover was low at 0-5% and included Buffel Grass and Shrubby Stylo. The vegetation community was subject to disturbance form historical vegetation clearing and tree thinning, particularly the selective removal of Poplar Box trees.

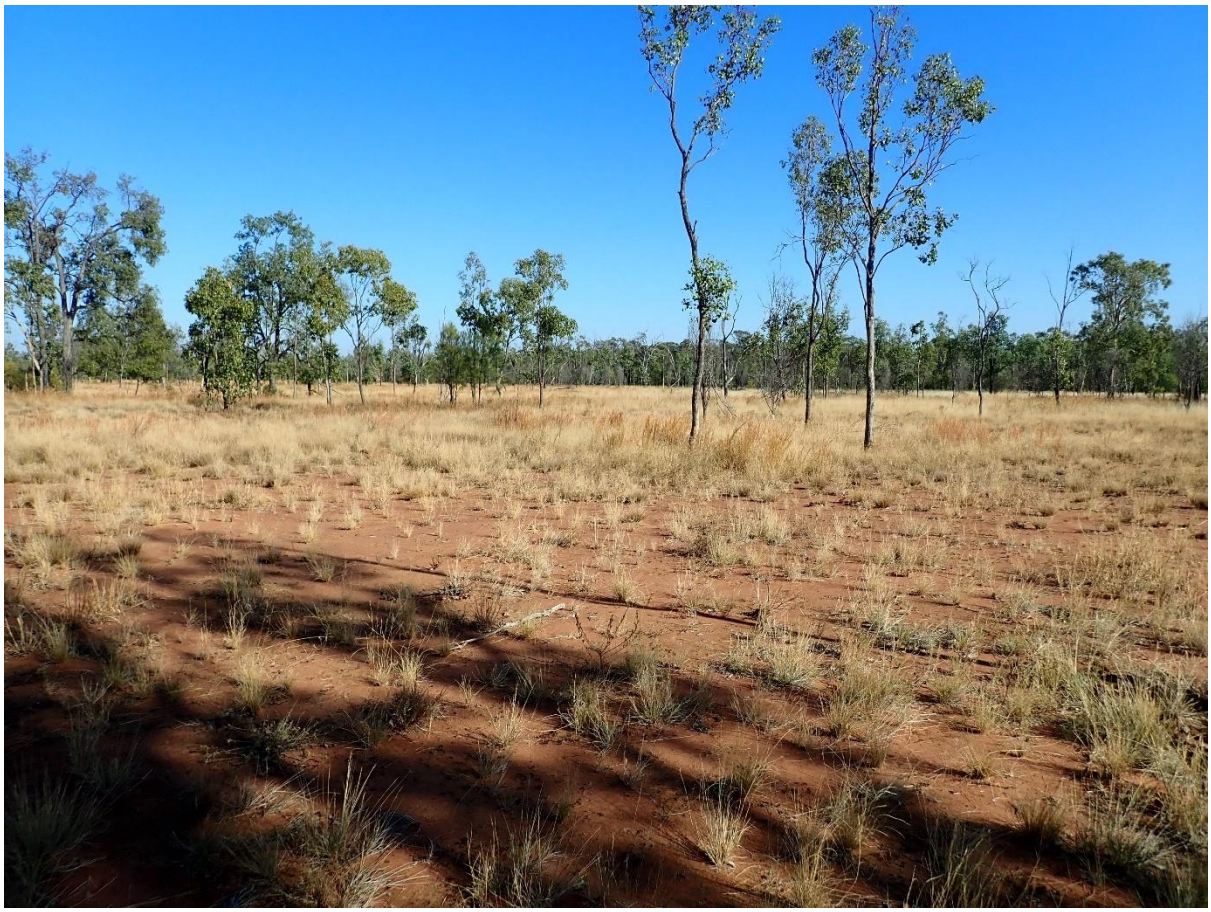


Plate 4. Regrowth Poplar Box woodland

6.1.3.6 Queensland Blue Gum open forest

Very restricted occurrence within the south-east corner of the Study area. Associated with alluvial soils along a heavily disturbed drainage line (Rockland Creek). The community extent is often very narrow having been subject to past clearing. The canopy height ranges between 22 m and 28 m with up to 70% cover. The dominant canopy species along the riparian fringe is Queensland Blue Gum (*Eucalyptus tereticornis*) with a lower storey of Black Tea-tree (*Melaleuca bracteata*). Above the drainage line on an alluvial terrace the canopy was more varied including Queensland Blue Gum, Poplar Box and Carbeen (*Corymbia tessellaris*). There is a scattered lower tree layer comprising Supplejack, Kurrajong and Yellow-wood. The ground layer is dense (70% cover) and is dominated by the introduced Guinea Grass. The native Black Speargrass also occurs.

6.1.3.7 Silver-leaved Ironbark woodland

Occurs in the north-east of the Study areas well as a small patch in the central portion. This vegetation community occurs on old loamy sandy plains and varies from woodland to open-woodland depending on the amount of previous disturbance. The community is dominated by Silver-leaved Ironbark with scattered Poplar Box and Long-fruited Bloodwood. Canopy height varied between 15-25 m with a highly variable cover of 20-50%. There is a sparse shrub layer including Quinine Tree and False Sandalwood. The ground cover was usually dense given the open canopy. The introduced Buffel Grass was common (ranging from 10-50% cover) along with native species including Black Speargrass. This community was often disturbed including signs of tree thinning as well as cattle and weed impacts.

6.1.3.8 Additional vegetation communities

The following two vegetation communities have been mapped as occurring in the far south-east corner of the Study area and were not able to be assessed for the Project due to a lack of access at the time. The following summaries and example photos are derived from reporting by EMM (2022) on which the ground-truthed mapping is based for this portion of the Study area.

Mountain Coolibah open woodland

Occurs as a very sparse woodland on basalt-derived soils associated with low rises and hills (**Plate 5**). The canopy cover ranges between 10-30% and is dominated by Mountain Coolibah (*Eucalyptus orgadophila*) with occasional Variable-barked Bloodwood (*Corymbia erythrophloia*). Shrubs were very sparse and included Prickly Bursaria (*Bursaria incana*) and Dead Finish (*Archidendropsis basaltica*). The ground cover was often dense (50-90% cover) and dominated by the introduced Buffel Grass. Native grass species included Black Speargrass and Kangaroo Grass.

Semi-evergreen vine thicket

Occurs as a single isolated patch located on a relatively steep basaltic slope surrounded by Mountain Coolibah open woodland. The patch is intersected by the southern boundary of the Study area. The community features emergent Queensland Bottle Tree and Broad-leaved Bottle Tree (*Brachychiton australis*). The lower tree and shrub layer is relatively low-growing and dense (**Plate 6**). Tree species includes Red Ash, Supplejack, Queensland Ebony (*Lysiphyllum hookeri*), Yellow-wood and Small-leaved Condoo (*Planchonella pubescens*). Shrub species comprised Scrub Boonaree, Turkey Bush (*Acalypha eremorum*) and Narrow-leaved Croton (*Croton phebalioides*). The ground layer is naturally very sparse within the community itself, although the edges tended to be dominated by the introduced Guinea Grass and Buffel Grass.

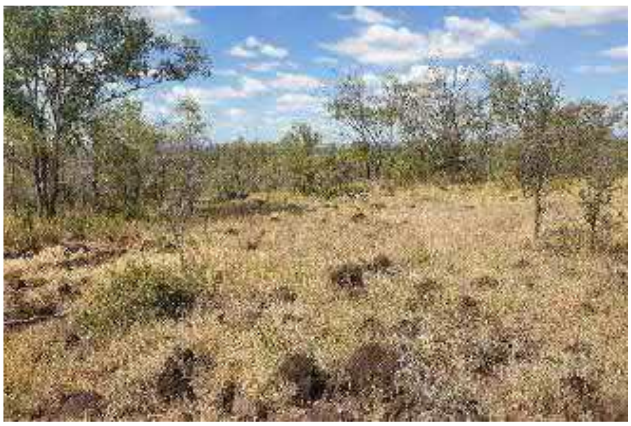


Plate 5. Example of Mountain Coolibah open woodland (EMM 2022)

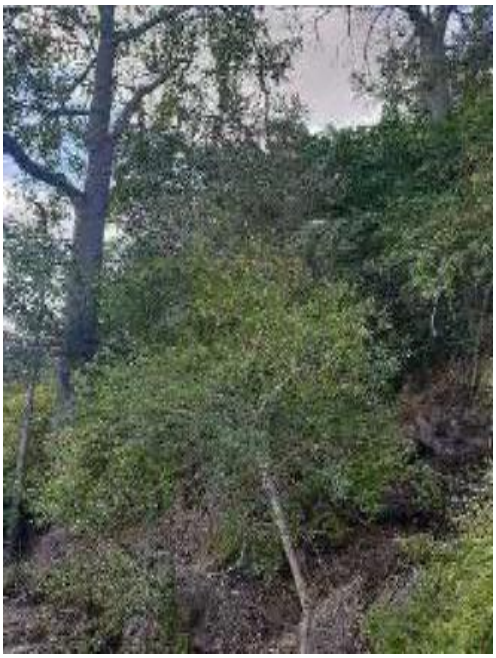


Plate 6. Example of semi-evergreen vine thicket (EMM 2022)

<insert figure here>

Figure 9. Ground-truthed Regional Ecosystems and survey sites

6.1.4 Threatened Ecological Communities

6.1.4.1 Brigalow TEC

Brigalow TEC (*Acacia harpophylla* dominant or co-dominant) was identified within the Study area during Project surveys. The TEC is listed as Endangered under the EPBC Act. Remnant and regrowth vegetation identified as Brigalow woodland are considered analogous to Brigalow TEC and comprised the following remnant and regrowth REs: 11.3.1, 11.4.7, 11.4.8, 11.4.9, 11.4.9a and 11.5.16.

There are no survey guidelines associated with the Brigalow TEC. Brigalow is a perennial tree with no seasonal requirements. It is an obvious feature in the landscape where it occurs. The survey effort is considered sufficient for describing the extent of the TEC potentially impacted by the project within the Study area.

The overall extent of Brigalow TEC within the Study area subject to ground-truthing survey effort is estimated to be 259.44 ha. Additional areas in the north of the Study area mapped as partially comprising RE 11.5.16 (10% or 30 % of mapped polygons) were not subject to flora surveys as they were not close to the Project and therefore not considered relevant to potential impacts.

As stated previously the ground-truthed vegetation mapping indicated substantial differences with the State mapping including the following:

- RE 11.5.16 was not identified as present within the majority of surveyed areas in the north of the Study area. Almost all areas mapped as comprising RE 11.5.16 were found to be wholly occupied by Poplar Box woodland (RE 11.5.3).
- A large patch of RE 11.4.9 in the north of the Study area was found to be correctly mapped (**Plate 5**), although the patch extent was reduced
- Substantial areas mapped as mixed polygons partially including RE 11.4.8 were found to be wholly occupied by 11.5.3. Other areas mapped as RE 11.4.8 were found to be dominated by Lancewood. Brigalow was not present and these areas do not represent Brigalow TEC
- Remnant RE 11.3.1 was mapped along Humboldt Creek in the south-west of the Study area and Rockland Creek in the east (previously mapped as non-remnant)
- Regrowth RE 11.4.8 analogous to Brigalow TEC occurs as a narrow strip along Meroo Downs Road in the centre of the Study area (**Plate 6**). A nearby area comprises remnant RE 11.4.7. Both areas were previously mapped as non-remnant.
- A large patch of vegetation intersected by the southern boundary of the Study area was observed to be occupied wholly by remnant and regrowth RE 11.4.9a. This increased the extent of Brigalow TEC mapped in this area.

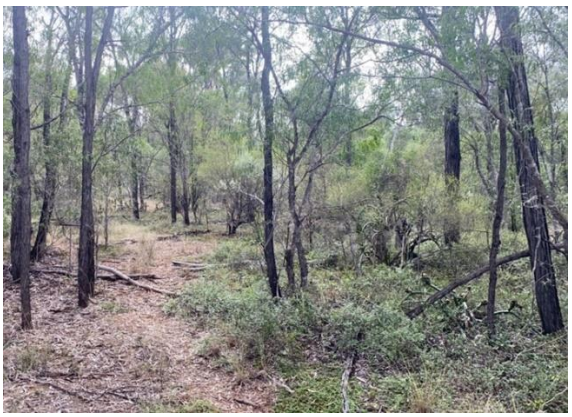


Plate 7. Brigalow TEC represented by remnant RE 11.4.9 in north of Study area (site BC7)

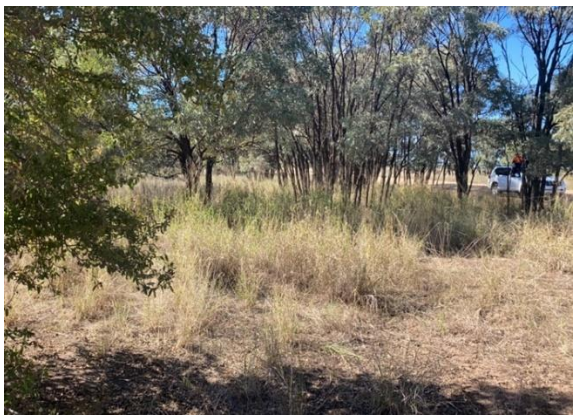


Plate 8. Brigalow TEC represented by narrow strip of regrowth RE 11.4.8 (site BC1)

The key diagnostic characteristics and condition thresholds identifying occurrences of Brigalow TEC (as detailed in DE 2013a) include:

- Key diagnostic characteristics:
  - The presence of Brigalow as one of the most abundant tree species and is either dominant or codominant
  - Meets the description of one of the REs described in Section 1.7.1 of DE 2013a
- Condition thresholds:
  - Patch is 0.5 ha or more in extent
  - Weedy perennial plants comprise less than 50% of the vegetation cover across 0.5 ha within the patch

The ground-truthed floristic data collected was assessed against the criteria as is shown in **Table 8**. Survey data including RE and Biocondition sites relevant to Brigalow TEC is provided in **Appendix B**. In general, weed cover in Brigalow patches was found to be low and all areas of sufficient size (>0.5 ha) were found to be analogous to the description of Brigalow TEC.

Table 8. Brigalow RE patches recorded within Study area compared with TEC diagnostic criteria/condition class identified in DE 2013a

Analogous RE	Growth status	Brigalow dominant	Weed cover <50%	Area (ha)	Brigalow TEC
11.3.1	Remnant	Yes	Yes	2.13	Yes
11.3.1	Remnant	Yes	Yes	6.82	Yes
11.3.1	Remnant	Yes	Yes	9.96	Yes
11.3.1	Remnant	Yes	Yes	2.86	Yes
11.3.1	Regrowth	Yes	No	3.89	No*
11.4.7	Regrowth	Yes	Yes	13.27	Yes
11.4.8	Remnant	Yes	Yes	65.67	Yes
11.4.8	Remnant	Yes	Yes	10.66	Yes
11.4.8	Remnant	Yes	Yes	3.31	Yes
11.4.8	Remnant	Yes	Yes	5.16	Yes
11.4.8	Regrowth	Yes	Yes	3.57	Yes
11.4.9	Remnant	Yes	Yes	41.52	Yes
11.4.9	Remnant	Yes	Yes	23.29	Yes
11.4.9	Remnant	Yes	Yes	6.38	Yes
11.4.9a	Remnant	Yes	Yes	1.09	Yes
11.4.9a	Remnant	Yes	Yes	35.56	Yes
11.4.9a	Regrowth	Yes	Yes	2.68	Yes
11.4.9a	Regrowth	Yes	Yes	19.03	Yes
11.4.9a	Regrowth	Yes	Yes	5.66	Yes
11.5.16	Remnant	Yes	Yes	0.82	Yes
			Total TEC present	**259.44**	

*Based on assessment by EMM (2022)

6.1.4.2 Other TECs

A single small area potentially comprising Natural Grasslands TEC intersected by the southern boundary of the Project (refer **Section 5.3.2**) was observed to be occupied by regrowth RE 11.4.9a (analogous to Brigalow TEC). No patches of Natural Grassland TEC were observed within the Study area.

Patches of vegetation located along Rockland Creek in the south-east of the Study area were mapped as comprising regrowth vegetation potentially analogous to Poplar Box TEC. Site assessments concluded this area was dominated by Queensland Blue Gum and Poplar Box TEC vegetation is not present.

A single area of SEVT TEC has been previously mapped (EMM 2022) as occurring in the south-east corner of the Study area. Approximately 1 ha occurs on a southern-facing slope on basaltic geology. There are no condition thresholds associated with the SEVT TEC listed in the relevant conservation advice (DCCEEW 2023). As such, it is assumed all occurrences of the community are considered representative of the TEC. The patch is

surrounded by Mountain Coolibah woodland and is located approximately 300 m from the nearest Project infrastructure.

6.1.5 Conservation Significant Flora Species

The likelihood of occurrence assessment for conservation significant flora species identified in database searches determined that a single species, *Solanum elachophyllum*, is known to occur within the Study area (based on records associated with works carried out by EMM 2022). A single flora species is likely to occur within the Study area (refer **Table 9**):

- Annual wiregrass (*Aristida annua*)

One further flora species is considered a possible occurrence within the Study area:

- Ooline (*Cadelia pentastylis*)

The remaining threatened flora species are considered unlikely to occur within the Study area and are not considered further in this report.

Table 9. Likelihood of occurrence assessment of conservation significant flora species

Species	Habitat and distribution	Likelihood of occurrence
Leichhardtia brevifolia EPBC Act: V NC Act: V	The species is known to occur in woodlands on serpentine rock outcrops and serpentine derived soils. The species is distributed across northern and central Queensland in areas of suitable habitat (DEWHA 2008a).	**Unlikely**. Suitable habitat for the species does not occur within the Study area. The species was not observed during project field surveys. The nearest historical record of the species is located 37 km to the south-west (ALA 2024).
Ooline (*Cadellia pentastylis*) EPBC Act: V NC Act: V	This species occurs on the western edge of the New South Wales (NSW) north-west slopes, from Mt Black Jack near Gunnadah to west of Tenterfield, and extends into Queensland to Carnarvon Range and Callide Valley, south-west of Rockhampton (DEWHA 2008b). This species grows in semi-evergreen vine thickets, Brigalow woodland and Poplar box woodlands on undulating terrain of various geology, including sandstone, conglomerate and claystone (DEWHA 2008b).	**Possible**. Suitable habitat for the species occurs throughout the Study area in the form of Brigalow and Poplar box dominated woodland vegetation, although the species was not observed during project field surveys. The nearest historical record of the species is located 23 km to the north-east (ALA 2024).
Bertya opponens EPBC Act: V NC Act: LC	Suitable habitat for the species includes shrublands, mallee, open-forest and woodland and semi-evergreen vine-thicket on shallow sandy or stony soils (TSSC 2016).	**Unlikely**. Suitable habitat for the species does not occur within the Study area. The dominant soils in the Study area are cracking clays. The species was not observed during project field surveys. The nearest historical record of the species is located 14 km to the north-east (ALA 2024).
Annual Wiregrass (*Aristida annua*) EPBC Act: V NC Act: V	This species is known to occur in eucalypt woodlands on black clay and basalt soils. This species is restricted to central Queensland in the Emerald and Springsure districts (DE 2014a).	**Likely**. Suitable habitat for the species occurs through the Study area. The species was not observed during project field surveys although the species is a rare annual. The nearest historical record for the species is located 6.5 km to the north (ALA 2024).
King Blue-grass (*Dichanthium queenslandicum*) EPBC Act: E NC Act: V	Suitable habitat for the species primarily includes black cracking clay soils supporting tussock grasslands in association with other species of blue grasses (*Dichanthium* spp. and *Bothriochloa* spp.) (DES 2022b). Other habitat types includes eucalypt woodland with *Corymbia dallachiana*, *Corymbia erythrophloia* or *Eucalyptus orgadophila*. The species is distributed from near Dalby north to about 90 km north of Hughenden and west as far as Clermont.	**Unlikely**. Suitable habitat for the species does not occur within the Study area. Grasslands within the Study area are non-native, dominated by invasive pasture grasses and subject to heavy grazing pressure. The species was not observed during project field surveys. The nearest historical record for the species is located 14 km to the north (ALA 2024).

Species	Habitat and distribution	Likelihood of occurrence
Dichanthium setosum EPBC Act: V NC Act: LC	Suitable habitat for the species includes open grassy woodland, grassland, cleared woodland and disturbed pastures on basaltic black soils and red-brown loams with clay subsoil (DEWHA 2008c). This species occurs in inland NSW and Queensland, as well as in Western Australia and Tasmania. In Queensland, it has been reported from the Leichhardt, Morton, North Kennedy and Port Curtis regions, and in the Mistake Range, in Main Range National Park, and possibly on Glen Rock Regional Park, adjacent to the national park (DEWHA 2008c).	**Unlikely**. The species was not observed during project field surveys. The nearest historical record for the species is located 35 km to the south-west (ALA 2024). The Project area is heavily disturbed and does not comprise the soils the species is usually associated with. Suitable habitat for the species occurs adjacent to but outside the Study area in the form of regrowth woodland on basalt-derived soils (RE 11.8.4). Woodland and cleared pasture areas within the Study area supported by Tertiary-early Quaternary clay deposits and loamy and sandy plains do not provide suitable habitat for the species.
Polianthion minutiflorum EPBC Act: V NC Act: LC	Small shrub with greyish green and hairy leaves growing up to 1 m high. Occurs in woodlands on sandstone slopes with skeletal soils and sometimes sandy soils associated with weathered laterite geology. May occur in woodlands which may include *Acacia shirleyi*, *Eucalyptus corynodes*, *E. cloeziana*, *E. major*, *E. dura*, Corymbia *aureola and/or C. trachyphloia.* Occurs in scattered populations from Redcliffe Vale south to the Kingaroy area (QH 2012)	**Unlikely.** The species was not observed during project field surveys. The species has been recorded in Amaroo State Forest (2002 and 2003) 25 km north of the Study area (ALA 2024). Suitable habitat for the species does not occur within the Study area.
Solanum dissectum EPBC Act: E NC Act: E	Suitable habitat for the species includes Brigalow open forest or woodland, and *Eucalyptus thozetiana* woodland on solodic clay soils (DES 2022c)	**Unlikely**. Suitable habitat for the species does not occur within the site. The species was not observed during project field surveys. The nearest historical record of the species is located 11 km to the north-east (ALA 2024).

6.1.6 Weed Species

A total of 14 non-native weed species were identified within the Study area including a six invasive pasture grasses with Buffel Grass (*Cenchrus ciliaris*) being the most abundant and comprising between 5 % and 30 % of ground cover in wooded areas. Buffel grass has infested cleared areas and also invaded woodland vegetation including Brigalow. Parthenium (*Parthenium hysterophorus*) was also dense in cleared areas, particularly sites with clay soils and with greater soil moisture. Prickly Pear (*Opuntia stricta*) was scattered in low density across the Study area. Non-native flora species identified within the Study area, their Biosecurity listings and Weeds of National Significance (WoNS) status are provided in **Table 10**.

Table 10. Non-native flora species identified within the Study area

Common name (Species name)	Biosecurity Act category	WoNS
African Lovegrass (*Eragrostis curvula*)	-	-
Black Pigweed (*Trianthema portulacastrum*)	-	-
Buffel Grass (*Cenchrus ciliaris*)	-	-
Flannel Weed (*Sida cordifolia*)	-	-
Guinea Grass (*Megathyrsus maximus*)	-	-
Harrisia Cactus (*Harrisia martinii*)	3	-
Parthenium (*Parthenium hysterophorus*)	3	Yes
Prickly Pear (*Opuntia stricta*)	3	Yes
Purple Pigeon Grass (*Setaria incrassata*)	-	-
Red Natal Grass (*Melenis repens*)	-	-
Rhodes Grass (*Chloris gayana*)	-	-
Sabi Grass (*Urochloa mosambicensis*)	-	-
Shrubby Stylo (*Stylosanthes scabra*)	-	-
Siratro (*Macroptilium atropurpureum*)	-	-

6.2 Fauna Survey Results

The April 2022 and February 2023 surveys recorded a total of 138 fauna species including 10 frogs, 18 reptiles, 91 bird and 19 mammal species within and in the immediate surrounds of the area. This includes at least 11 microbat species recorded via Anabat monitoring. The fauna comprised a range of mostly widespread and common fauna species known from the region. A complete list of the observed fauna species is provided in **Appendix C.**

6.2.1 Observed Fauna

6.2.1.1 Herpetofauna

Frogs in particular were commonly observed during the 2023 survey during spotlighting and funnel trapping activities (both targeting waterholes). Of the 10 species identified eight were caught in funnel traps. Common species included Green-striped Frog (*Cyclorana alboguttata*), Salmon-striped Frog (*Limnodynastes salmini*) and Northern Banjo Frog (*Limnodynastes terraereginae*) (refer **Plate 9**). The introduced Cane Toad (*Rhinella marina*) was commonly observed throughout during spotlighting.

Reptiles were generally less conspicuous due to the heavy ground cover and the targeted nature of the funnel trapping activity. As such, no species were commonly recorded. Nevertheless, 18 species were identified across both surveys including two geckos, eight skinks, two dragons (refer **Plate 10**) and six snake species.

Ideal conditions were encountered during the 2023 survey for detecting Ornamental Snake. Conditions were hot and humid, patchy rain occurred in the area and prey species (frogs) were commonly observed and trapped. Four traps sites were established next to standing water in gilgais (refer **Figure 7** for locations and **Appendix C** for location data). The species was not recorded within the Study area, or driving to and from the Study area during either the 2022 or 2023 surveys.

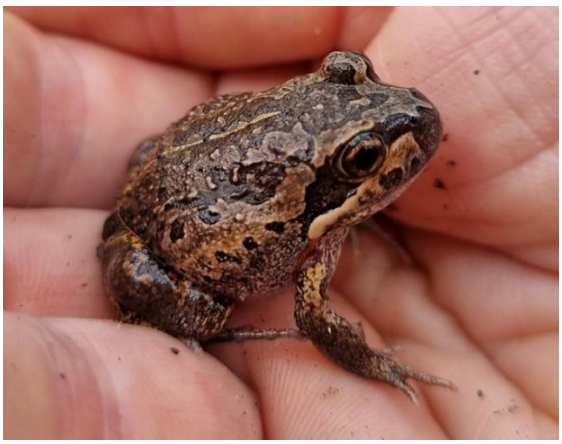


Plate 9. Northern Banjo Frog (February 2023)

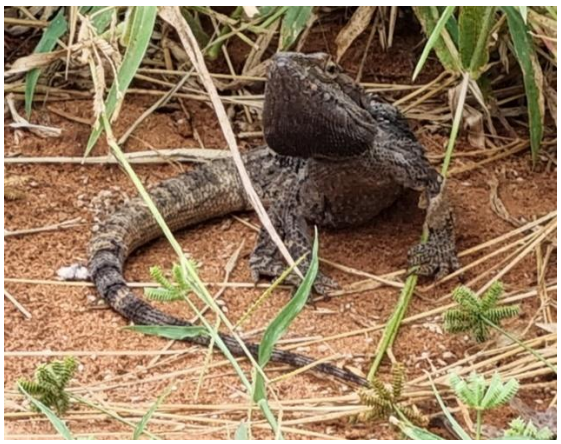


Plate 10. Bearded Dragon (February 2023)

6.2.1.2 Birds

Sixty-eight bird species were recorded in April 2022 and 78 species recorded in January-February 2023. Of the overall total of 91 species recorded 82 of these were identified on Togara and 59 species on Meroo Downs. This reflects both the highly modified habitat present, and a resulting lesser survey focus on that property. Timbered areas provided habitat for a range of species common to the region including Peaceful Dove (*Geopelia striata*), Striped Honeyeater (*Plectorhyncha lanceolata*), Grey-crowned Babbler (*Pomatostomus temporalis*) and Pied Butcherbird (*Cracticus nigrogularis*). The abundant grasslands present provide habitat for a range of species associated with open habitats including Horsfield's Bushlark (*Mirafra javanica*), Rufous Songlark (*Megalurus mathewsi*), Brown Falcon (*Falco berigora*), finch species and Black-faced Woodswallow (*Artamus cinereus*). Nocturnal birds were observed to be common during both surveys and in particular during the 2023 survey. This was likely influenced by the good growing conditions at the time contributing to prey abundance.

6.2.1.3 Mammals

Native mammal species were dominated by microbats (11 species) as recorded by echolocation recordings. In general mammals were only sparingly observed which may reflect the heavy grass cover and limited availability of habitats able to be surveyed, particularly for spotlighting activity. The only macropod observed onsite was scattered individuals of Eastern Grey Kangaroo (*Macropus giganteus*). Short-beaked Echidna (*Tachyglossus aculeatus*) was observed on a single occasion. Rufous Bettong (*Aepyprymnus* rufescens) was recorded off-site although tracks likely to be of the species were recorded within the Study area. No arboreal mammals were observed.

6.2.2 Fauna Habitat Values

In general, faunal habitat quality at the time of the January 2023 survey was in relatively good condition due to recent rainfall. Grass coverage was dense across much of the Study area. Shallow water-filled waterholes were scattered across Togara and frog activity was high. Nevertheless, the fauna habitat values present are limited by the extent of vegetation clearing and blade ploughing for cattle grazing purposes. The following sections describe the habitat values observed within the Study area.

6.2.2.1 Eucalypt Woodlands

Dry woodland communities dominate the tracts of vegetation remaining in the Study area. These largely occur on the Togara property excepting a single stand of disturbed woodland near the homestead and a narrow riparian corridor (also highly disturbed) along Humboldt Creek on Meroo Downs. Throughout much of the Study area these communities appear to have been impacted by past tree clearing or tree thinning with few

large canopy trees present (**Plate 11**). More contiguous tracts of vegetation in the north-east of the Study area remain in better condition. Dominant canopy species throughout include Poplar Box, Silver-leaved Ironbark (*E. melanophloia*), Dawson Gum (*E.* cambageana) and Long-fruited Bloodwood. There is a distinct lower storey often dominated by White Cypress Pine, Wilga (*Geijera parviflora*), Acacia species and immature canopy trees. Buloke (*Allocasuarina luehmannii*) occurs in the north of the Study area. As noted above, the shrub layer was variable in extent and the ground layer was often dense due to the wet summer conditions experienced in the region prior to the February 2023 survey.

Past tree clearing activities have limited the availability of some habitat features useful to fauna. Large tree hollows provide shelter/nest sites for a range of arboreal fauna (such as large gliders, possums owls and parrots) but were uncommon throughout due to the lack of old growth trees. Similarly, large woody debris, which provides shelter for a range of ground dwelling fauna species was generally sparsely distributed.

Nevertheless, these woodland habitats provide seasonal food resources for nectivorous bird species (honeyeaters and lorikeets), year-round prey resources for smaller insectivorous bird species and microbats, and small tree hollows suitable as shelter sites for microbats and small gliders. Koala is known to utilise the leaves of a variety of eucalypt species for foraging. It is noted no arboreal mammal species were recorded during spotlighting surveys. In general, the bird assemblage recorded during the site surveys was restricted to widespread and commonly occurring species.

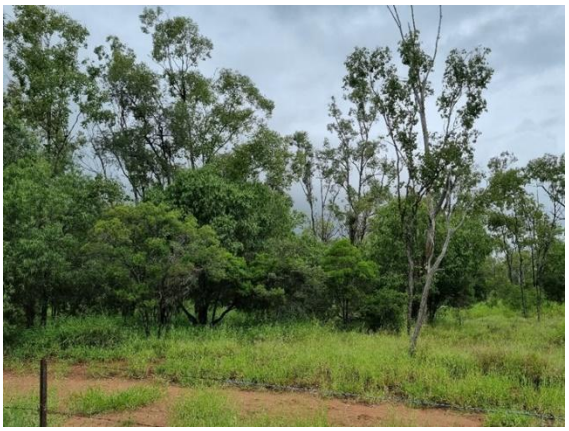


Plate 11. Disturbed Poplar Box woodland – southern portion of Togara (February 2023)

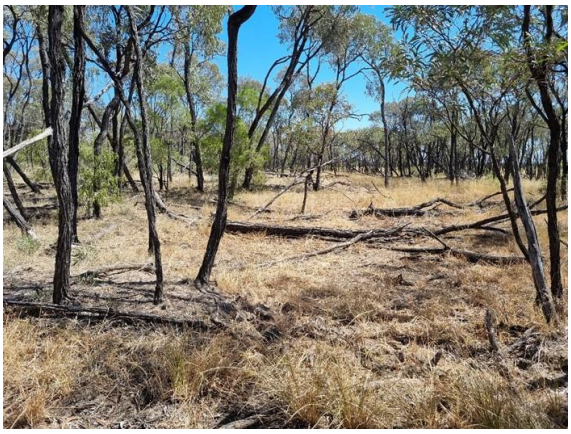


Plate 12. Disturbed Brigalow woodland - Togara (April 2022)

6.2.2.2 Acacia Woodlands to Open Forest

There are stands of open forest/woodland dominated by a continuous canopy of Brigalow (refer **Plate 12**) or Blackwood scattered within Togara property, as well as a single patch of Brigalow with a vine-thicket understorey located in the south of the Study area on Meroo Downs. Brigalow has been extensively cleared across much of the Study area. These patches are often disturbed with an uneven canopy (but provide suitable foraging values for a variety of smaller forest bird species (e.g. Weebill (*Smicrornis brevirostris*), Rufous Whistler (*Pachycephala rufiventris*) and fairywrens) that prefer a more closed canopy and dense low vegetation. There is abundant shelter for small ground fauna (particularly reptiles) in the form of low shrubs and fallen timber. Gilgais occur in some stands of remaining Brigalow in the south of Togara. Following heavy rainfall gilgais may provide habitat for frogs and associated predators such as snakes, herons and egrets.

6.2.2.3 Non-remnant Grasslands

Non-remnant grasslands dominate much of the Study area including much of the southern portion of Togara and almost all of Meroo Downs. These areas are often heavily dominated by the introduced Buffel Grass, as well as other introduced grass species (refer **Table 10**). Parthenium was also common where dark clay soils occurred. In general, the grasslands provide limited structural and floristic diversity, and thereby limited faunal diversity in comparison to forested habitats.

The Togara property has been subject to blade ploughing (anecdotally) although appears much less intensive than occurs on Meroo Downs. As such there is substantially more micro-landform variation and gilgais occur. These generally occur as sparsely scattered, wide and shallow (<50 cm deep) depressions (refer **Plate 13**)

Plate 13. Blade plough areas (April 2022)

Scattered gilgaied areas comprising standing water were found to be common during the February 2023 survey (refer **Plate 14**). Nevertheless, there are lesser areas of more frequent deeper gilgais. The grasslands on Togara are still dominated by Buffel Grass but there is more diversity of native species present, often associated with the gilgai depressions. Brigalow occurs as sparsely scattered regrowth in areas not subject to recent ploughing. This habitat was targeted during the February 2023 survey due to the potential presence of Ornamental Snake (as associated with gilgaied areas). A variety of frog species were common in the vicinity of water-filled gilgai depressions which provides forage value for some predator species such as snakes, herons and egrets. Waterholes provide temporary watering points for a variety of other fauna. Otherwise, the limited structure of grasslands provide habitat for species that depend on grasslands and open habitats for foraging such as Eastern Grey Kangaroo (*Macropus giganteus*), finches, Horsfield's Bushlark (*Mirafra javanica*), Rufous Songlark (*Megalurus* mathewsi) and Jacky Winter (*Microeca fascinans*).

The Meroo Downs property has been subject to intensive blade ploughing to encourage pasture grass growth for cattle grazing. In the south-west of the Study area paddocks adjacent to Humboldt Creek are subject to cropping activity. As a result there is little habitat variation across the entire property with few stands of large trees and no observed evidence of gilgai formations. Buffel Grass is dominant with scattered individuals or patches of low regrowth trees occurring, often dominated by *Acacia crassa* (refer **Plate 15**). Given the poor structural diversity present the grassland habitat on Meroo Downs provides very limited value for fauna being largely restricted to grassland bird species such as Horsfield's Bushlark, Australian Pipit (*Anthus australis*) and Golden-headed Cisticola (*Cisticola exilis*) as well as other widely occurring species of open country.

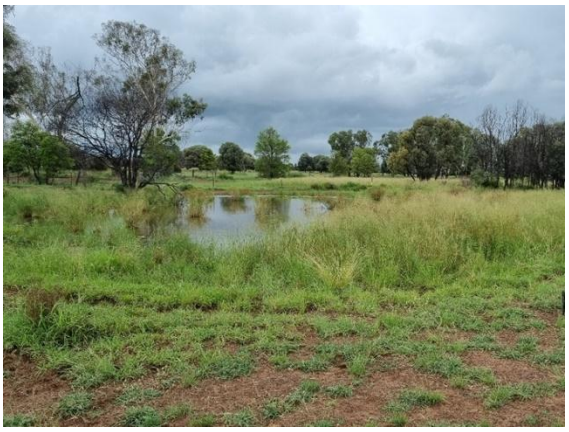


Plate 14. Water-filled gilgai on Togara (February 2023)

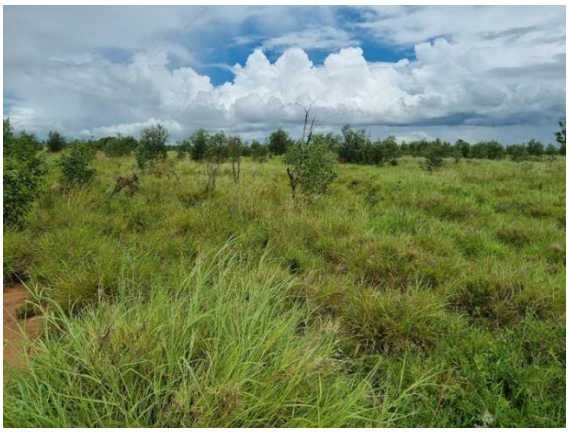


Plate 15. Non-remnant grassland on Meroo Downs (February 2023)

6.2.3 Conservation Significant Fauna

No conservation significant fauna listed as threatened or migratory were recorded during the 2022 or 2023 survey. A single species listed as SLC under the NC Act was recorded: Short-beaked Echidna.

A detailed assessment of the likelihood of occurrence within the Study area of conservation significant fauna species identified during the desktop review is provided in **Table 11**. Of the conservation significant fauna species identified in the desktop review, one species is known to occur (Short-beaked Echidna) and two species are considered likely to occur (Ornamental Snake and Koala). A further six threatened species are considered as potentially occurring. A further four species listed as Migratory under the EPBC Act may also possibly occur based on the habitat values present within the Study area.

Table 11. Likelihood of occurrence assessment of conservation significant fauna species

Species	Data source	Ecology and distribution	Likelihood of occurrence
Threatened Species			
Red Goshawk (*Erythrotriorchis radiatus*) EPBC Act: V NC Act: E	PMR	Endemic to northern and eastern Australia in coastal and subcoastal areas with large home ranges of up to 200 km^2. Occurs where there are extensive tracts of woodlands and forests and prefers mosaic habitats that hold a large population of birds and permanent water. Riparian areas are heavily favoured (Marchant & Higgins 1993). In partly cleared habitats in eastern Australia it occurs in areas with gorges and escarpments (Garnett et al. 2011).	**Unlikely**. The nearest records are several from 1996-1998 located in Blackdown Tablelands National Park (41-51 km north-east of the Study area. There are scattered records in the wider region surrounding the Study area but all are older (pre 1981) (ALA 2024). The wider landscape associated with Study area is mostly cleared. There is no suitable habitat present for the species.
Australian Painted Snipe (*Rostratula australis*) EPBC Act: E NC Act: E	PMR	Breeding only occurs in swamps with temporary water regimes and complex shorelines forming islands, shallow water, exposed wet mud and dense low fringing vegetation (Rogers et al. 2005; Geering et al. 2007). In non-breeding periods the species may be found in dams, waterlogged grasslands and roadside drains (Marchant & Higgins 1993). The only wetland habitat present in the Project area are two farm dams with no vegetative cover present.	**Possible**. The two closest known records are both undated *Birdlife Australia* records (ALA 2024). The records are 38 km and 47 km west of the Study area. There are no other records within 60 km of the Study area. The Study area comprises areas of gilgais which may provide transient habitat for the species following heavy rainfall periods. The species potential use of these sites would be temporary and very sporadic, if it occurs at all.
Sharp-tailed Sandpiper (*Calidris acuminata*) EPBC Act: V, M NC Act: V	PMR	Non-breeding spring/summer migrant to Australia, which is largely coastal in occurrence but may occur on inland wetlands, particularly during migration. Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	**Possible.** Not recorded during any Project surveys. There are database records for Sharp-tailed Sandpiper although none within 50 km of the Study area (ALA 2024). Sharp-tailed Sandpiper may occur occasionally around farm dams within the Study area. Mainly larger dams with shallow edges as occur in the south of the Study area.
Curlew Sandpiper (*Calidris ferruginea*) EPBC Act: CE, M NC Act: CE	PMR	In Australia Curlew Sandpiper mostly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays and lagoons. It also uses swamps, lakes, saltworks and sewage ponds. Less often it is recorded inland, around lakes, dams and bore drains, usually with bare edges of mud or sand (Higgins & Davies 1996).	**Unlikely**. The closest known record is from 1976 at Lake Maraboon, southwest of Emerald and approximately 65 km from the Project area (ALA 2024). The species prefers large waterbodies with shallow muddy edges for foraging. The waterbodies in the Project area are relatively small farm dams and are not suitable for the species.
Latham's Snipe (*Gallinago hardwickii*) EPBC Act: V, M NC Act: V	PMR	Occurs in a wide variety of permanent and ephemeral wetlands, preferring open freshwater wetlands with fringing vegetation. The species is also recorded from swamps, billabongs, lakes, edges of creeks and rivers, bogs, marshes behind coastal sand dunes and some artificial waterbodies. It will occur in any vegetation around wetlands, including grasslands, heath, woodland and forest (Higgins & Davies 1996).	**Possible**. No nearby records of the species. Permanent wetlands in the Study area are restricted to farm dams. Observations at these sites indicated little aquatic or fringing vegetation present at these sites. There is a minor potential for the species to occur, although likely only in a transient manner.

Species	Data source	Ecology and distribution	Likelihood of occurrence
Squatter Pigeon (southern) (*Geophaps scripta scripta*) EPBC Act: V NC Act: V	PMR	The southern subspecies of the Squatter Pigeon occurs mainly in dry grassy eucalypt woodlands and open forests (Frith 1982; Crome & Shields 1992), also inhabiting Cypress Pine and acacia woodlands (Frith 1982). It mostly occurs on sandy sites near permanent water (Blakers et al. 1984), and particularly favours areas of sandy soil dissected by low gravelly ridges close to water (Frith 1982). Breeding habitat includes stony rises occurring on sandy or gravelly soils, within one km of a suitable, permanent waterbody (Squatter Pigeon Workshop 2011), and alluvial areas, which are also important habitat (Frith 1982).	**Possible**. Not observed during surveys for the Project and not recorded during surveys for other projects in the wider area (Golders 2019; EMM 2022). The two closest known records are both undated *Birdlife Australia* records (ALA 2024). The records are 15 km and 24 km north of the Study area. Both records have a high spatial uncertainty (9 km) placed on the record. There are scattered records of the species in all directions in the surrounding region. Much of the Study area comprises unsuitable clay soils. Nevertheless, the species may utilise the woodland areas with sandy soils (regrowth and remnant RE 11.5.3).
Grey Falcon (*Falco hypoleucos*) EPBC Act: V NC Act: V	PMR	Species occurs in arid and semi-arid inland Australia where annual rainfall is less than 500 mm. Younger individuals may disperse outside of this habitat in drought years that follow wet years in inland Australia. Preferred habitat includes sparsely timbered lowland plains, particularly Acacia shrublands that are crossed by tree-lined water courses. The species has been observed hunting in treeless areas and frequents tussock grassland and open woodland, especially in winter (Schoenjahn 2018; TSSC 2020).	**Unlikely**. There are sparse records scattered in the wider area surrounding the Study area the nearest of which is 41 km east of the Study area. All of these records are older (pre 1981) (ALA 2024). Mean rainfall in the Rolleston region is above 600 mm (BoM 2023). The Study area is located outside the core range of the species. There are no recent records close to the Study area and the habitat present is marginal at best. Occasional dispersing vagrant individuals may occur but the Study area is generally unsuitable for the species.
Painted Honeyeater (*Grantiella picta*) EPBC Act: V NC Act: V	PMR	Sparsely distributed from south-eastern Australia to north-western Queensland and eastern Northern Territory (Garnett & Baker 2021). The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland (from approximately Roma south) (DCCEEW 2023). The species forages on mistletoes in eucalypt forests/woodlands, riparian woodlands of black box and river red gum, box-ironbark-yellow gum woodlands, Acacia dominated woodlands, paperbarks, *Casuarinas*, *Callitris*, and trees on farmland or gardens. The species prefers woodlands which contain a higher number of mature trees, as these host more mistletoes (DE 2015).	**Possible**. The nearest records of the species are from 1985 and 2017 and located 38 km and 48 km north-east of the Study area (ALA 2024). All other records are further west and south. The Study area is on the eastern edge of the species range. Suitable non-breeding habitat for the species does occur within the site, particularly areas with Brigalow. However, mistletoes were observed to be generally rare across the Study area.
Star Finch (southern) (*Neochmia ruficauda ruficauda*) EPBC Act: E NC Act: E	PMR	Occurs in grasslands and grassy woodlands, near permanent water, and sometimes in or near cleared suburban areas. Also reported along river banks dominated by native grasses and sedges. Distribution is poorly known. The subpopulation is currently thought to be extinct (Garnett & Baker 2021).	**Unlikely**. There are sparsely scattered records in the wider region surrounding the Study area. The nearest of these is located 38 km north with an uncertain collection date (possibly 1986). There are no recent records of the subspecies and it likely no longer occurs at all.

Species	Data source	Ecology and distribution	Likelihood of occurrence
Southern Black-throated Finch (*Poephila cincta cincta*) EPBC Act: E NC Act: E	PMR	The species prefers grassy, open woodlands and forests, dominated by *Eucalyptus, Corymbia* or *Melaleuca*. Tussocks grasslands and freshwater wetlands also provide occasional habitat. The species is typically observed in riparian habitats or near water. The subspecies is currently only locally common in Queensland at sites near Townsville and Charters Towers, with records scattered throughout the Brigalow Belt North and Desert Uplands bioregions (BTFRT 2007).	**Unlikely.** Database records in the wider region are all older records (pre-1976) and the species is very likely extinct in the region. The closest recent database records (2016) are from a known population associated with the Bravus coal mine and are over 290 km north-west of the Study area (ALA 2024). Will not occur.
Diamond Firetail (*Stagonopleura guttata*) EPBC Act: V NC Act: V	PMR	Occurs in lightly timbered habitats with high grass coverage. May occur in farmlands with scattered trees. Once occurred as far north as Cardwell in Queensland but now only occurs in the far south of the state. Prefers areas with a low density of trees, little fallen timber and a heavy grass cover (DCCEEW 2023).	**Unlikely.** There are sparsely scattered records in the surrounding region (none within 38 km of the Study area) although all of these are older records (pre 1982). The only recent record is from 2020 and located over 140 km to the south in Expedition Range National Park. Even this record appears very isolated from other recent records which are much further south (ALA 2024). It is unlikely the remaining habitats in the Study area are suitable for the species given the dominance of Buffel Grass through much of the Study area. The species is very unlikely to currently occur in the region.
Short-beaked Echidna (*Tachyglossus aculeatus*) NC Act: SLC		The species is specialised for feeding on ants, termites and beetle larvae. It occurs in almost all terrestrial habitats except for highly modified areas and is active both by day and night. It shelters in logs, caves, crevices, burrows and leaf litter. The Short-beaked Echidna occurs throughout Australia and although it may be sparsely distributed in some areas, especially arid regions, it remains ubiquitous and common (Augee 2008; Menkhorst 2010).	**Known.** Individual observed within the Study area during the 2023 survey. Scats also observed in 2022. The species is widespread and can occur in both remnant and heavily disturbed habitats.
Northern Quoll (*Dasyurus hallucatus*) EPBC Act: E NC Act: LC	PMR	Northern Quoll is most common around rocky escarpments but is also found in eucalypt forest and woodland and around human settlements. It is now absent from much of its former range, and although it may be locally common the species is rapidly declining (Oakwood 2008). In Queensland the species is now only known from the most rugged and remote parts of its range, mostly along the ranges along the east coast (Burnett 2012), mostly confined to rocky outcrops that provide protection from Cats (*Felis catus*) and too-frequent fires (Baker & Dickman 2018). Its range is now highly fragmented (Woinarski et al. 2014) and may be as little as 10% of its potential range (Baker & Dickman 2018).	**Unlikely**. There are three records located 47 km west of the Study area (from 1967, 1975 and one undated) and a 1997 record located 41 km south (ALA 2024). The Study area is heavily disturbed and largely cleared of woody vegetation. There is no rocky shelter habitat present. Cane Toads were observed as abundant during surveys. The species is unlikely to occur.

Species	Data source	Ecology and distribution	Likelihood of occurrence
Greater Glider (*Petauroides volans*) EPBC Act: E NC Act: E	PMR	Greater Glider is found from the Windsor Tableland in north Queensland to central Victoria, occurring from sea level to 1200 m (Woinarski et al. 2014). The species lives in a variety of eucalypt-dominated forest and woodland. The species requires woodlands with large tree hollows for daytime shelter sites. The species is absent from regenerating forest lacking old trees with suitable hollows. Home ranges are about 1-4 ha in size in productive forests (Kehl & Borsboom 1984) and up to 16 ha in less productive areas. The species forages in a restricted range of tree species within its distribution. Eyre (2006) notes in drier inland forests in the region Greater Gliders preferred forests dominated by red gums (*E. camaldulensis* and *E. tereticornis*), grey gums (*E. longirostrata* and *E. biturbinata*), Lophostemon species and Spotted Gum.	**Unlikely**. Not observed during surveys for the Project and not recorded during surveys for other projects in the wider area (Golders 2019; EMM 2022). There are a large number of records to the north-east associated with the Blackdown Tablelands (at least 38 km from the Study area). The closest records are from along the Comet River in 1997 and are 24 km south of the Study area. There are several other records to the south and west including relatively recent records (2012 and 2016) near Springsure (48 km west) (ALA 2024). The Study area has been heavily impacted by vegetation clearing. The dominant eucalypt species present is Poplar Box which is not a preferred tree species based on a detailed analysis of species records (Eyre et al. 2022b). Riparian habitat along Humboldt Creek within the Study area is heavily degraded with few trees with large hollows. While the species may occur along the Comet River there is little suitable habitat present within the Study area.
Koala (*Phascolarctos cinereus*) EPBC Act: V NC Act: V	PMR WildNet	Associated with eucalypt woodland and forest habitats comprising suitable food trees, mainly of the following genus: *Eucalyptus*, *Corymbia*, *Angophora* and *Melaleuca* (Moore & Foley, 2000; Martin et al. 2008). They are not necessarily restricted to bushland areas and are known to occur and breed where suitable tree species occur within farmland and the urban environment (Dique et al. 2004).	**Likely**. A large number of database records in the wider area including two records (1976 and 1996) within the Study area itself. Most records are older (pre1990). The nearest recent record is from 2012 and located 17 km south-east of the Study area (ALA 2024). In recent surveys for other projects in the area Koalas were detected to the east of the site in riparian and Acacia woodlands (EMM 2022) and scats were detected along a creek line by Golder (2019). Within the Study area the most suitable habitat is along Humboldt Creek in the south-east.
Ghost Bat (*Macroderma gigas*) EPBC Act: V NC Act: E	PMR	The species occurs across a range of habitats, from arid Pilbara to tropical savanna woodlands and rainforests. During the daytime they roost in caves, rock crevices and old mines. Roost sites used permanently are generally deep natural caves or disused mines with a relatively stable temperature of 23°–28°C and a moderate to high relative humidity of 50–100 percent. The average foraging distance is approximately 2 km from the daytime roost (DCCEEW 2023).	**Unlikely**. Suitable rocky roosting habitat for the species does not occur within or near the Study area. The nearest records of the species include a 1997 record 41 km south and 1985 record from the Blackdown Tableland (54 km north-east). No suitable habitat is present.

Species	Data source	Ecology and distribution	Likelihood of occurrence
Corben's Long-eared Bat *Nyctophilus corbeni* EPBC Act: V NC Act: V	PMR	Surveys suggest the species requires large tracts of forest to occur (Turbill et al. 2008). It occurs in a range of woodlands but the preferred habitat is mallee and *Callitris* woodlands and habitats that have a distinct canopy with a dense, cluttered understorey (Pennay et al 2011; Turbill & Ellis 2006).	**Unlikely**. There is a 1998 record from Blackdown tableland 42 km to the east and an 1883 record 87 km east of the Study area. All other species records are at least 120 km south of the Study area. The Study area is located on the northern edge of the species potential distribution. The Study area has been heavily impacted by tree clearing and does not support the preferred habitats or large tracts of woodlands the species requires.
White-throated Snapping Turtle (*Elseya albagula*) EPBC Act: CE NC Act:	PMR	Found in the major drainage basins of the Fitzroy, Burnett and Mary rivers of south-east Queensland. There are also records from the Raglan, Kolan and Gregory-Burrum drainages (Thomson et al. 2006). The species is most commonly found in flowing water, with log tangles, undercut banks and irregular rocky substrate that act as shelter. It is rarely found in ephemeral waterbodies or in waterbodies away from flowing streams. It is generally scarce or absent in standing waterbodies created by dams or weirs (Hamann et al. 2007).	**Known (west of Study area)**. The species was recorded in the Comet River to the east of the Study area in March 2023 during aquatic ecology surveys for the Project. There are no previous publicly available database records of the species occurring in the Comet River. Species records occur in the Makenzie River downstream of the confluence with the Comet River. The only substantial creek associated with the Study area is Humboldt Creek which is ephemeral and is unsuitable for the species occurrence.
Fitzroy River Turtle (*Rheodytes leukops*) EPBC Act: V NC Act: V	PMR	The Fitzroy River Turtle is limited to the Fitzroy River catchment in central Queensland (Gordos 2012). Known sites include Boolburra, Gainsford, Glenroy Crossing, Theodore, Baralba, the Mackenzie River, Connors River, Duaringa, Marlborough Creek and Gogango (DE 2020a). It occurs in fast-flowing clear rivers (Ehmann 1992). Core areas of activity are focused on riffle zones year-round. The species doesn't move far, even during flood events, and as base flows re-establish, individuals are found within a few hundred metres of riffles. If the riffle zone is seasonally ephemeral or dried completely, females retreat to deeper sections of pools (Tucker et al. 2001).	**Unlikely**. The species may occur in the Comet River to the west of the Study area although there are no publicly available database records of the species occurring. The only substantial creek associated with the Study area is Humboldt Creek which is ephemeral and appears highly unsuitable for the species occurrence.
Collared Delma (*Delma torquata*) EPBC Act: V NC Act: V	PMR	The species is typically associated with west-facing ridgelines with dry open sclerophyll and Acacia woodlands with an open midstorey and a ground cover of native grasses, thick leaf litter and abundant loose rocks (Peck 2012). Surface rocks are a significant habitat feature.	**Unlikely**. The nearest database record is from 1997 and located in the Blackdown tableland (53 km north-east). Soils in the area largely comprise cracking clays with areas of sandy soils. There are no raised rocky areas and no suitable habitat present.

Species	Data source	Ecology and distribution	Likelihood of occurrence
Yakka Skink (*Egernia rugosa*) EPBC Act: V NC Act: V	PMR	The species occurs in a wide variety of habitat types, particularly eucalypt/Acacia woodlands and open forests. Yakka skinks usually occur on well-drained, coarse, gritty soils in the vicinity of low ranges, foothills and undulating terrain (Ehmann 1992; Brigalow Belt Reptiles Workshop 2010) but are also found on loam and clay soils (Eddie 2012). The species lives in communal burrow systems, often under timber and in deep rock crevices (Ehmann 1992; Wilson 2015).	**Unlikely**. The nearest record is located 24 km to the west and is a Queensland Museum record with no collection date and a high spatial uncertainty (10 km). There is a 1976 record located 44 km north of the Study area (ALA 2024). The Study area largely comprises cracking clay soils cleared of vegetation in flat undulating country. There are no rocky areas or ridgelines present. There is little suitable habitat for the species present.
Ornamental Snake (*Denisonia maculata*) EPBC Act: V NC Act: V	PMR	Largely restricted to low-lying areas with deep-cracking clay soils, which are subject to seasonal flooding, and adjacent areas of clay and sandy loams. Habitat includes woodland and shrubland, such as Brigalow , and riverine habitats, where the species lives in soil cracks and under fallen timber (Ehmann 1992; Wilson & Swan 2010). The species may be found in areas of simple habitat structure, such as paddocks, grasslands and regrowth if frogs are present (Melzer 2012).	**Likely**. Not recorded during surveys for the Project despite ideal conditions for detecting the species. Recorded during surveys for other projects in the wider area (Golders 2019; EMM 2022). All sightings were located west of the Comet-Rolleston Road despite targeted surveys for the species within the east of the current Study area (EMM 2022) and to the immediate south (Golders 2018). Two of these records are located within 3 km east of the Study area. There are areas of gilgai habitat on Togara property which may support the species. Potential habitat on Meroo Downs has been heavily impacted by blade ploughing and does not appear suitable. Cane Toads were noted as abundant during Project surveys.
Grey Snake (*Hemiaspis damelii*) EPBC Act: E NC Act: E	PMR	Occurs on floodplains (Ehmann 1992) and is often found in seasonally inundated areas, preferring cracking, flood-prone clay or loam soils and areas with gilgais. The preferred habitat for the species in southern Queensland is woodlands featuring Brigalow , *Casuarina cristata* and *Eucalyptus populnea* (Hobson 2012) on dark, cracking clay soils (Hobson 2012; DCCEEW 2022). The species is often found in riverine habitats near watercourses, natural levees, gullies and ditches (Ehmann 1992; DCCEEW 2022).	**Possible**. Not observed during surveys for the Project and not recorded during surveys for other projects in the wider area (Golders 2019; EMM 2022). The nearest record is from 2003 and located 39 km north of the Study area (ALA 2024). Most other records are located much further south in southern Queensland. The Study area is on the north-west edge of its potential distribution. There is suitable gilgaied habitat present although records of the species in the region are scarce.
Migratory Bird Species			

Species	Data source	Ecology and distribution	Likelihood of occurrence
Glossy Ibis (*Plegadis falcinellus*)	WildNet	Glossy Ibis is considered migratory and nomadic (Marchant & Higgins 1990; Matheu & del Hoyo 1992) and is generally uncommon and erratic in occurrence (Pringle 1985). Glossy Ibis occurs in terrestrial wetlands, preferring inland freshwater wetlands with abundant aquatic flora (Pringle 1985; Marchant & Higgins 1990). Within Australia, the species moves in response to good rainfalls, expanding its range, however the core breeding areas used are within the Murray-Darling Basin region of New South Wales and Victoria, the Macquarie Marshes in New South Wales, and in southern Queensland. Breeding typically occurs in dense colonies, often with other waterbirds and occurs in response to flood events (Pringle 1985).	**Possible**. Single 2018 database record 19 km north of Project. Permanent wetlands in the Study area are restricted to farm dams. Observations at these sites indicated little aquatic vegetation present. There is a minor potential for the species to occur, although likely only n a transient manner.
Common Sandpiper (*Actitis hypoleucos*) Pectoral Sandpiper (*Calidris melanotos*)	PMR	Non-breeding spring/summer migrants to Australia, which are largely coastal in occurrence but may occur on inland wetlands, particularly during migration. Pectoral Sandpiper mostly occurs on shallow fresh or saline wetlands where it forages in shallow water or soft mud at the edges. Common Sandpiper occurs mostly in the north and west. It prefers narrow and often steep shorelines, often away from other waders. It is most common along mangrove-lined creeks but will also use sewage ponds and dams (Higgins & Davies 1996; Menkhorst et al. 2017).	**Unlikely**. Not been recorded during any Project surveys. There are no nearby records for either species. Common Sandpiper and Pectoral Sandpiper largely occur in near coastal areas.
Gull-billed Tern (*Gelochelidon nilotica*)	WildNet	Caspian Tern occurs mostly in sheltered coastal habitats, such as bays, estuaries, harbours and inlets, usually with sandy or muddy margins. Gull-billed Terns prefer shallow wetlands, particularly those with mudflats including estuaries, river deltas, lakes, swamps and lagoons, including ephemeral waterbodies. Both use fresh and saline waterbodies and occur on inland wetlands, especially lakes, and reservoirs and rivers (Marchant & Higgins 1996).	**Possible**. Generally aquatic habitat within the Study area for these species is unsuitable (i.e. relatively small farm dams and ephemeral creek lines). Nevertheless, the two species may occasionally occur on larger dams in the south of the Study area on Meroo Downs and Struan properties.
Caspian Tern (*Sterna caspia*)	WildNet		
Oriental Cuckoo (*Cuculus optatus*)	PMR	The species mostly occurs on the northern and eastern coasts of Australia, between September and April. Oriental Cuckoos occur in rainforest, vine thicket and open forest and woodland. The species is sometimes found in mangroves and is often recorded in gardens and plantations (Blakers et al. 1984; Higgins 1999).	**Unlikely**. Sparse records in the wider area although none within 45 km of the Study area. The species generally occurs in habitats closer to the coast. Habitat within the Study area has been heavily modified and generally is unsuitable for the species presence.

Species	Data source	Ecology and distribution	Likelihood of occurrence
Fork-tailed Swift (*Apus pacificus*)	PMR	Fork-tailed Swift breeds in Asia and occur throughout Australia from September/October to April. The species is widespread in Australia (Higgins 1999). In Australia, Fork-tailed Swift is almost exclusively an aerial species, probably even sleeping on the wing, though individuals are occasionally recorded roosting in trees.	**Possible**. Sparse records in the wider area although none within 45 km of the Study area. Species occurs widely across Australia in the summer months and may occur over almost any habitat, including highly modified environments.
Satin Flycatcher (*Myiagra cyanoleuca*)	PMR	Satin Flycatcher inhabits east coast forests (Menkhorst et al. 2017), avoiding dry habitats and is virtually confined to the east of the Great Dividing Range (Boles 1988). During passage it may occur in coastal forests, woodlands, mangroves, gardens and trees in open country (Pizzey 1980). Satin Flycatcher is infrequently seen in central and northern Queensland, where it is mostly a passage migrant (Menkhorst et al. 2017).	**Unlikely**. Scattered records in the wider area although none within 40 km of the Study area. The veracity of records in inland Queensland may be questionable. The species is easily confused with the much more common Leaden Flycatcher (*Myiagra rubecula*). Habitat within the Study area has been heavily modified and generally is unsuitable for the species presence.
Yellow Wagtail (*Motacilla flava*)	PMR	Yellow Wagtail is a regular migrant to coastal Australia but in small numbers. Occurs in open areas with low vegetation, especially in cultivation and on lawns, sporting fields and airfields, as well as sewage farms and occasionally beaches (Higgins et al. 2006; Menkhorst et al. 2017).	**Unlikely**. There is no record of Yellow Wagtail within 280 km of the Project. The majority of records in Australia are coastal or near coastal.

6.2.4 Pest Species

Seven species of feral animal were recorded during the field surveys within the Study area (refer **Table 12**). Only Cane Toad was observed to be common (during spotlighting surveys). Common Myna was observed sporadically at several sites throughout the Study area. Of the species, four are listed under Schedule 2 of the Biosecurity Act as 'Restricted Matters'.

Table 12. Pest species identified during the 2022/23 field surveys

Scientific name	Common name	Biosecurity Act categories
Sus scrofa	Pig	3.4.6
Mus musculus	House Mouse	-
Acridotheres tristis	Common Myna	-
Rhinella marina	Cane Toad	-
Oryctolagus cuniculus	Rabbit	3,4,5,6
Canis lupus	Common Dog/Dingo	3,4,6
Felis catus	Cat	3,4,6

7 POTENTIAL PROJECT IMPACTS AND MITIGATION MEASURES

The Project infrastructure and components are described in detail in **Section 2** including proposed timelines associated with construction, operation and decommissioning/rehabilitation. The indicative Project footprint is shown in **Figure 9** overlaid on the field-verified vegetation mapping. For conservation significant species considered as potentially occurring, direct impacts were assessed for loss of habitat caused by the construction of Project infrastructure.

7.1 Potential Project Impacts

The Project activities have potential to directly and indirectly impact a range of ecological values, including vegetation communities and habitat for threatened flora and fauna. The majority of impacts are expected to occur during construction of Project infrastructure which comprises the following:

- CSG production well pads (34 lateral wells and 34 production well pads with a maximum disturbance area per well pad of 1 ha). Following construction 0.04 ha (20 m x 20 m) at each well will be retained for the operational phase and the remainder will be rehabilitated (based on the previous flora species/vegetation community present). Production wells will be fenced and generally include gas and water metering and separation equipment, electrical and control systems, particulate filter separator and manifolds to connect the water and gas pipelines
- New access tracks where required (disturbance width of 6 m on average within the gas gathering line disturbance area). Approximately 8 km of new access tracks will be required over the life of the Project.
- Gathering flow line disturbance area for gas (disturbance width of 18 m excepting intersection of habitat for threatened fauna where reduced to width of 6 m). Includes excavation of a trench (up to 0.85 m wide) that may include co-located power and communication lines. Horizontal directional drilling (HDD) will be used at sensitive watercourse crossings in order to avoid impacts to surface vegetation and the watercourse structure.
- One temporary construction camp requiring 1 ha located in previously cleared grazing lands that are not located in areas mapped as suitable habitat for Ornamental Snake, to be located near site construction works
- Gas compression facility (GCF) (disturbance area of 20 ha) including:
  - CSG processing and water management/storage infrastructure
  - Site offices
  - One permanent operational camp
  - Other ancillary infrastructure (e.g. storage buildings)

The current proposed layout of the Project is depicted on the ground-truthed vegetation mapping for the Study area in **Figure 9**. The design of the Project may be subject to further refinement as the final design phase progresses.

The lifespan of the Project is expected to be 30 years. Wells will be constructed over the first 10 years of the Project (expected to be four wells constructed per year). The lifespan of a single well is expected to be between 12 to 15 years. Decommissioning/rehabilitation works will be carried out when Project infrastructure is no longer required or operational (refer **Section 2** for further detail). As such, site rehabilitation activity will be ongoing throughout the life of the Project. Decommissioning/rehabilitation of the GCF is expected to be the final activity associated with the Project.

7.1.1 Clearing Vegetation

The clearing of vegetation is the most significant and direct impact of the Project on ecological values of the Project area. Land clearance is listed as a key threatening process under the EPBC Act. The removal of habitat reduces the size of local populations of flora and fauna dependent on that habitat. These impacts are immediate and significant in the short-term. Impacts may persist in the long-term if habitat created during rehabilitation does not closely resemble pre-disturbance ecosystems. In addition, if sufficient habitat refuges

are not maintained locally, prior to the maturation of rehabilitated land, local extinction of certain species may occur.

The overall layout of the Project gas field infrastructure currently encompasses a total of 178.27 ha. However, as describe above and in detail in **Section 2**, the Project construction will occur over an extended development period and much of the overall layout subject to construction disturbance will not be required for operation and will be subject to ongoing rehabilitation. As such, the disturbance area associated with the overall layout will not be present across the Study area at any one point in time.

Given the heavily modified landscape present, Project infrastructure has been located away from sensitive ecological values as much as is feasible. The disturbance footprint has been subject to several revisions in order to further avoid identified higher value habitats including avoiding Brigalow TEC and gilgai habitat suitable for Ornamental Snake.

The predicted extent of overall impact to vegetation communities and habitat for threatened species (including MNES) is provided in **Table 13** and **Table 14**. The extent of impact is based on the results of the ground-truthed vegetation mapping, analysis of aerial imagery and onsite habitat assessments (particularly with regard to Ornamental Snake). The Project is predicted to impact a maximum of 1.28 ha of remnant woodland vegetation under the current layout. An additional potential impact to threatened fauna species is on gilgai habitat considered suitable for Ornamental Snake which does not require the presence of overhead woody vegetation (i.e. the species can occur in non-remnant areas). Grey Snake and Australian Painted Snipe may also utilise this habitat.

Table 13. Predicted vegetation clearing for Project gas field infrastructure based on current layout

RE	Biodiversity (EP Act) status	Potential MNES habitat	Extent within Study area (ha)	Proposed impact area (ha)
11.3.1	Endangered	Ornamental Snake, Grey Snake, Brigalow TEC	25.66	0
11.3.4	Of concern	Koala, Squatter Pigeon	2.42	0
11.3.25	Of concern	Koala, Squatter Pigeon	29.31	0.11
11.4.7	Endangered	Ornamental Snake, Grey Snake, Koala, Brigalow TEC, Annual Wiregrass	13.27	0
11.4.8	Endangered	Ornamental Snake, Grey Snake, Koala, Brigalow TEC, Annual Wiregrass	88.37	0
11.4.9/a	Endangered	Ornamental Snake, Grey Snake, Brigalow TEC, Ooline, Annual Wiregrass	135.21	0
11.5.3	No concern	Koala, Squatter Pigeon, Ooline	1,673.97	1.17
11.5.9a	No concern	Koala, Squatter Pigeon	224.75	0
11.5.16	Endangered	Ornamental Snake, Grey Snake, Brigalow TEC	0.82	0
11.7.2	No concern	Squatter Pigeon	104.76	0
11.8.5	No concern	Koala, Squatter Pigeon	27.43	0
11.8.13	Endangered	SEVT TEC	1.02	0
Non-remnant (gilgais present)	-	Ornamental Snake, Grey Snake, Wetland birds	1,476.89	0.89
Water	-	Wetland birds	26.11	0
Non-remnant (other)	-	N/A	10,254.74	176.10
		Overall area	**14,084.74**	**178.27**

Table 14. Predicted extent of MNES habitat and vegetation clearing for Project based on current layout

MNES	Extent within Study area (ha)	Proposed impact area (ha)
Brigalow TEC	259.44	0
SEVT TEC	1.02	0
Ooline	1,673.97	1.17
Annual Wiregrass	236.85	0
Koala	2,059.52	1.28
Squatter Pigeon	2,062.64	1.28
Wetland birds (Australian Painted Snipe, Sharp-tailed Sandpiper, Latham's Snipe, migratory species)	1,513.8 (non-remnant gilgai habitat)	0.89
Ornamental Snake	1,777.13 (non-remnant and remnant habitat)	0.89
Grey Snake	1,777.13 (non-remnant and remnant habitat)	0.89

7.1.2 Habitat Fragmentation, Connectivity and Edge Effects

Highly fragmented habitats support fewer species than connected blocks of habitat of the same size. This is because fragmentation restricts dispersal of fauna and plant seeds between available habitat. The impacts of habitat fragmentation depend on the degree to which dispersal is inhibited by habitat gaps, the size of the remaining habitat fragments, and ecological attributes of the species.

The landscape associated with the Project has been heavily impacted by tree clearing for cattle grazing purposes. The Project infrastructure has been situated in areas already cleared of vegetation wherever possible. There will be very little clearing of remnant vegetation required. The only impact to woody vegetation occurs in the south of the Study area and comprises two patches of Poplar Box woodland which are very open and likely already subject to degrading practices (past tree thinning and cattle grazing). The majority of infrastructure will be underground following completion of construction. The pipeline crossing required for Humboldt Creek will use HDD to avoid any requirement for surface disturbance of adjacent Brigalow TEC. As such, the Project will not create fauna movement barriers in the local landscape. There will be no impact to landscape connectivity and habitat fragmentation will not occur as a result of the Project.

The habitats that remain extant in the Project area are likely already subject to the potential for edge effects caused by increased exposure (along the edges of remaining patches) to wind and sun as well as increased weed invasion risk. Many patches within the south of the Study area are of a size or shape (thin remnants) as to be considered all edge. Some areas of extant woodland have been subject to past clearing or tree thinning. As noted above, the two woodland patches impacted by the Project are already very open in structure (**Plate** 16 and **Plate 17**). Regardless, the Project is proposing to clear a very minor extent of wooded habitat. The majority of the Project layout is located well away from any vegetation and will therefore not cause any edge effects to adjacent vegetation. Those portions of the Project located adjacent to extant vegetation communities are located along an existing edge already subject to edge effects. The Project is considered to have a negligible impact on increasing the impact of edge effects on MNES (including Brigalow TEC) within the Project area.

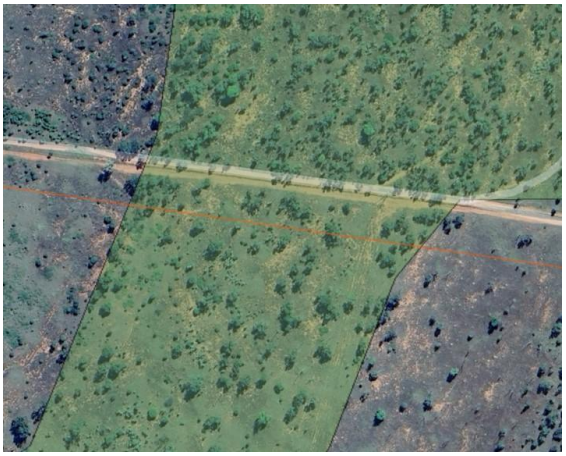


Plate 16. Indicative alignment impacting degraded RE 11.5.3 in south-east of Project (patch 1)

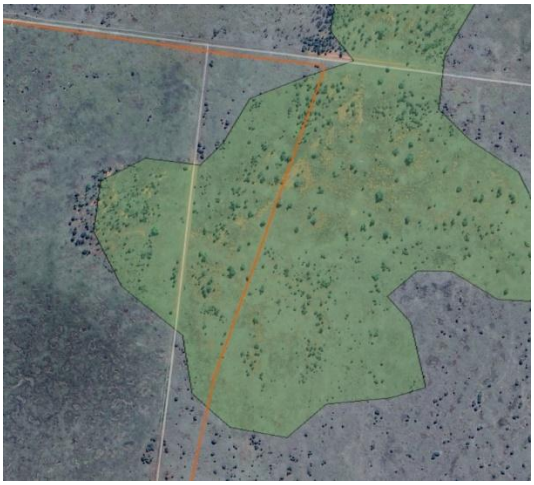


Plate 17. Indicative alignment impacting degraded RE 11.5.3 in south-east of Project (patch 2)

7.1.3 Fauna Mortality

Clearing of vegetation for the Project presents a risk of direct mortality or injury to fauna although this will largely be associated with ground fauna given very little woody vegetation is proposed to be impacted. Ground fauna of low mobility are at risk of injury or death from heavy machinery and vehicular movements during construction activity associated with the Project. Additional impacts include the trapping of fauna in trenches during installation of gas pipelines. The potential impact on fauna of increased vehicular activity in the Project area will be localised and relatively minor (maximum of 41 personnel estimated for construction purposes). Personnel associated with well construction (35 estimated) will reside onsite in the temporary accommodation camp (refer **Section 2.5**), further reducing the requirement for extended vehicle movements to access the site and potential impacts on fauna.

The operational phase is unlikely to add to these impacts due to the small scale of Project operations. Generally, only two personnel will be required onsite to maintain operations. As such, onsite vehicular movements will be minimal for operational works.

Clearing will only occur within designated areas and only during designated time periods. The presence of qualified Wildlife Spotter-Catcher/s to assist with initial clearing and daily checking of trenches will decrease incidences of fauna mortality. Educating employees and contractors with regard to fauna and flora will further reduce direct mortality as part of the Project.

7.1.4 Airborne Dust

Earthworks and vehicular traffic associated with Project construction and operation can generate substantial amounts of dust during dry weather (Field et al. 2010). Dust can have both a physical and chemical impact on plants, either through the smothering of leaves, whereupon the rate of deposition is important, or through chemical changes to the soil or directly to the plant surface. Changes in soil properties, such as pH, can ultimately impact plant species assemblages. Dust can form a hard crust on the leaf surface, increasing leaf temperature and increasing susceptibility to drought. Dust can have adverse impacts on plant photosynthesis, respiration, transpiration and productivity (Farmer 1993; Chaston & Doley 2006). Evidence of potential impacts on entire vegetation communities is scarce. Many studies focus on specific impacts to single species and findings may not be conclusive.

With regard to the Project, there is no available evidence to suggest that Brigalow is noticeably impacted by dust settlement. The pronounced wet and dry seasons associated with the Project area (inland southern Brigalow Belt) may make vegetation in these areas less susceptible to the impacts of dust. In general, the construction disturbance will take place well away from extant woody vegetation communities. The potential

impact from wind entrainment of exposed topsoil will be largely limited to construction activity. Post construction, areas no longer required for operation (refer **Section 2**) will be rehabilitated to the previous land use (i.e. grassland) and on establishment of vegetation will no longer present a dust risk.

7.1.5 Noise and Lighting

Understanding of the impacts of noise on fauna is limited. There are no current government policies or guidelines that recommend noise thresholds or limits for development activities to mitigate potential harm to fauna. Noise may affect wildlife through a variety of impacts such as: interfering with communication calls; interfering with foraging/defence through cloaking the sound of predators and prey; causing general stress or avoidance reactions; or changes in reproductive or nesting behaviours. Excessive noise may lead some species to avoid noisy areas, which could result in the localised fragmentation of habitat at the species or individual territory level. Radle (2007) states the consensus that terrestrial fauna will avoid any industrial plant or construction area where noise or vibration presents an annoyance to them. Nevertheless, many animals may interpret a new noise as a potential danger at first, but rapidly understand the noise is not associated with any threats (Radle 2007).

Artificial lighting may have a range of impacts across different groups of taxa and between species within these groups. Some taxa such as rodents may avoid brightly lit areas at night. Alternatively, nocturnal fauna such as many microbat species, frogs and some reptiles may congregate at artificial lights to feed on insects attracted to light (Perry et al. 2008; Rich & Longcore 2006). Although, other microbat species may avoid well-lit areas (Threlfall et al. 2013). Artificial light can alter foraging and calling by frogs and probably impairs their vision (Buchanan 1993) and may lead to individuals being killed by vehicles when attracted to lights for feeding on invertebrates.

Noise impacts from the Project to surrounding fauna habitat will largely be restricted to that emitted during construction activities. The gas compression facility is likely to be the only substantial source of noise and lighting impacts during operations. The facility is located in cleared habitat on Meroo Downs with poor habitat for fauna present. It is approximately 650 m away from the nearest patch of woody vegetation and there is no habitat for Ornamental Snake present. Post-construction it is expected that any resident fauna will become accustomed to the ongoing noise generated by the facility. The CSG production wells will be powered by a generator and are expected to emit low level noise that is not expected to impact fauna. Similarly, lighting at well sites will be unnecessary, or restricted to low levels that will not be an impact on fauna.

7.1.6 Weed and Pest Animals

Introduced weeds have the potential to impact on terrestrial and aquatic ecological values as native flora can become displaced through competition with weed species, and adversely affected by browsing and soil trampling caused by feral herbivores. Native fauna populations, particularly small to medium sized species, may be impacted by predation from introduced carnivores such as feral cats and Red Fox. These are indirect impacts which may not manifest themselves in the short-term and are likely to be exacerbated by existing cattle grazing activities on the Project lands. Introduced weed species are already present throughout the Study area which is dominated by Buffel Grass in the ground layer throughout. Buffel Grass is already considered a threat to Brigalow TEC (DE 2013a). Parthenium was observed to be common, particularly in the non-remnant grassland areas and is listed as a WoNS and under the State's Biosecurity Act.

The following activities associated with the Project have the potential to promote the proliferation of weeds and pests within the Study area, or introduce new weeds and pests from surrounding areas:

- The use of construction machinery, plant and materials sourced from outside the region and increased vehicular traffic in general may introduce and spread weed seeds if biosecurity hygiene measures are not in place
- Land clearance favours the establishment of weeds due to increased light and soil disturbance
- Inappropriate disposal and storage of putrescible wastes may attract feral animals

The pests and weeds currently occurring within the Study area are not expected to significantly proliferate in response to the Project activities. The main threat is the introduction of new weeds to the area via

contaminated vehicles or soils. Impacts will be managed by implementing biosecurity hygiene and control measures during Project activities.

7.1.7 Fire

The Project is located within largely cleared grazing lands with tracts of sclerophyll woodlands mainly to the north and north-west. The woodland areas have potential to be severely impacted by accidental high-intensity fires caused by Project activities. Fire hazard mapping for Queensland indicates the majority of woodlands within the Study area as having a 'medium potential bushfire intensity'. There are very small pockets of 'high' potential bushfire intensity' associated with woodland remnants in the south of the Study area on Meroo Downs and Memooloo properties.

Fire is noted as a threatening process on Brigalow TEC which occurs within the Study area. Fire intensity may be exacerbated by the dense growth habit associated with the introduced Buffel Grass which often dominates cleared areas within the Project area. Brigalow can recolonise areas subject to high-intensity burns through suckering from the root stock. A long-term study found that a Brigalow community subject to high-intensity burning (removing all trees) may take 50 to 80 years to approach pre-burn conditions (Johnson et al. 2016).

Nevertheless, the potential for the Project activity to cause accidental fires is considered negligible with simple measures in place. Project-specific fire management measures will be developed and implemented in line with Queensland guidelines and in collaboration with local landowners.

7.1.8 Surface Water

Much of the Study area is relatively flat and the Project infrastructure does not require any major earthworks or other changes to landform that would cause an impact/change to surface water flows across the landscape, including downstream of the Project. The only substantial area of land required is that for the GCF (20 ha) which is located in cleared lands subject to blade ploughing and away from any drainage areas. All other infrastructure will be linear, or plots for well sites. Following construction these areas will be largely revegetated.

The construction of gathering lines and associated access tracks could result in the removal of aquatic habitat and riparian vegetation from the bed and banks of waterways. The construction of gathering lines will avoid impacts to riparian vegetation through installation of pipes placed beneath the stream bed using the HDD construction method. The construction right-of-way would be up to 18 m wide and reduced to 6 m wide through waterways. The waterway crossings would comprise bed level or culvert crossings for vehicles and will utilise existing crossing areas.

The landscape has already been subject to artificial hydrological changes with farm dams located along drainage lines impeding downstream flows. Major access tracks (such as Meroo Downs Road) are often maintained above the adjacent landform and therefore also affect localised surface flows. The Project will not cause changes to landscape hydrological values which may impact MNES values such as Brigalow TEC or gilgai habitat suitable for Ornamental Snake.

Other potential impacts to aquatic habitats are associated with increased suspended sediments and resulting impacts to water quality. Even where the impacts go unmitigated these impacts would be localised, transient, and avoid areas of high aquatic value. Further, species inhabiting the waterways of the Project area and downstream are already subject to high sediment loads periodically during flow events as evidenced by high washloads (fine sediments held in suspension) observed during both the wet and dry season aquatic ecology surveys (DPM 2023).

7.1.8.1 Construction Impacts

The Project has potential to impact surface water and associated aquatic ecology values through a variety of processes:

- During construction disturbance, uncontrolled sedimentation of watercourses (particularly during and following heavy rainfall events) can impact aquatic ecology by smothering stream beds with fine material, and decreasing bed roughness and reducing habitat diversity

- Similarly, uncontrolled sedimentation movements associated with construction disturbance may lead to localised increased turbidity and suspended solids which may negatively impact fish and macroinvertebrates (through reduced respiratory and feeding efficiency), and adversely affect submerged aquatic plants as light penetration (required for photosynthesis) is reduced
- Poorly designed and constructed waterway crossings may create waterway barriers that prevent or impede movements of aquatic fauna
- Waterway crossings may cause bank instability if remediation works are not adequately designed and implemented. This may lead to bank erosion (causing impacts to instream sedimentation and turbidity) and adverse impacts to riparian vegetation

Waterways in the Project area are highly ephemeral and were observed to be largely dry at the time of the 2022 and 2023 ecology surveys. The only waterways of any substantive size are Humboldt Creek and the Comet River (to the west of the Project). The Project will develop and implement an Erosion and Sediment Control Plan (ESCP) to mitigate uncontrolled sediment flows into waterways as a result of Project works.

Pipeline crossings at waterways will be avoided where possible during the final Project design phase. Where pipeline crossings of waterways are required (such as at Humboldt Creek), they will be located underground through the application of HDD. If required, instream construction impacts such as access track construction will utilise existing farm tracks, be temporary and occur during the dry season to minimise the impact of sediment entrainment during rainfall-associated flow events.

7.1.8.2 Aquatic Pollutant Release

Chemicals used in the CSG well drilling process (i.e. fracking) may be toxic to the environment and have been subject to a number of assessments with regard to local CSG operations in southern Queensland (ERM 2017; KCB 2018). However, the Project does not require the use of fracking to access the seams for gas extraction. As such, the use of chemicals associated with fracking are not required.

The accidental release of pollutants from Project activities has the potential to degrade the surrounding environment and local waterways within and downstream of the Project area. Potential sources of contaminants may include runoff from chemical and fuel/oil storage areas and general wastewater from vehicle/machinery washdown areas. In the event of a significant fuel spill (>200 litres) (L) to waterways there is potential to have a local impact on both flora and fauna. The extent of impact will of course be dependent on the size of the spill and the volume of water in the waterway (including whether there is flow), thereby influencing the length of stream potentially impacted.

Nevertheless, despite the potential impacts broadly described above, it is noted the creeks in the Study area are highly ephemeral (no flows occurring the majority of the time) and are predominantly likely to be considered to be of low value (excepting Humboldt Creek and Comet River). Storage of chemicals associated with Project activities and vehicle refuelling sites will be located a minimum of 200 m from the nearest watercourse to further reduce the potential for accidental spills to impact waterways.

The Project will treat produced water generated by CSG extraction through reverse osmosis processing. Produced water will be stored in ‘feed tanks’ and saline water produce by processing will be stored in separate ‘brine tanks’ within the water treatment facility site. Treated water is proposed to be transferred to landholders for a beneficial use such as agriculture. The Project’s treated wastewater will be managed under the State’s End of Waste Code (EOWC) such that no impacts to aquatic ecological values are expected.

7.1.9 Groundwater

Targeted assessments of the potential for groundwater dependent ecosystems (GDEs) have been recently carried out within the Project area, generally with a focus on Brigalow communities. Additional installation of bores for monitoring the shallower aquifers associated with the Project has also been recently carried out.

Results from the monitoring of groundwater bores for the Project GDE assessment indicated some shallow groundwater at approximately 20 mbgl in the main portion pf the Study area and groundwater at 8 mgbl at a bore near the western boundary of the Study area (relatively close to the Comet River and Humboldt Creek). All bores providing shallow groundwater were found to have very high salinity levels (at least 30,000 µs/cm).

Saline groundwater is highly unlikely to be used as a source of water for surface vegetation (WaterMark EcoHydrology 2024).

The results of the GDE assessments identified no GDEs as present within the Project area (WaterMark EcoHydrology 2024). Brigalow communities were identified as having a maximum rooting depth of approximately 6 mbgl.

The Project is proposing to target CSG development at depths of roughly 120 mbgl to 220 mbgl. This will intersect groundwater associated with the Bandanna Formation which is not connected to the shallower groundwater currently subject to long-term monitoring.

There are no impacts associated with groundwater considered to occur on MNES as a result of the Project, given the depth and salinity of the available groundwater in the Project area and the lack of any GDEs identified as occurring within the Project area.

7.1.10 Cumulative Impacts

The Project occurs in a region with existing mining projects in the wider area including Whitehaven's Blackwater Coal Mine (10 km to the east at its closest point) and Glencore's Rolleston Open Cut mine 38 km to the south. Agricultural development (cropping for wheat and cotton) has substantially impacted lands to the immediate north-west and west of the Project. It is assumed these activities may have had impacts on MNES values across the surrounding landscape.

Regardless, the Project layout has been designed to avoid impacts on ecological values as much as is feasible. The project has a minimal impact on remnant vegetation (1.28 ha) or gilgai habitat (0.89 ha) that may provide value for MNES. The impact assessment for the Project identified a negligible impact overall and no significant impact predicted on relevant MNES (refer **Section 9.1**). As such, the Project is not considered to contribute a cumulative impact to existing impacts in the wider area, or any projects that may be approved or in the planning stage.

7.1.11 Project impact summary

The impacts of the Project will largely occur in lands that are already highly modified as a result of cattle grazing activity. Through ongoing design refinement, the direct impact of the overall Project footprint to potential MNES habitat has been minimised to 1.28 ha of woodlands and 0.89 ha of cleared gilgais. Due to the nature of the Project (comprising largely subsurface infrastructure) there will be no impact on landscape connectivity and direct impacts to waterways will largely be avoided. Indirect impacts from the Project such as dust settlement, erosion and edge effects are only a potential impact during the construction phase and considered to be negligible. Following construction, disturbed areas that are not required for operations will be subject to rehabilitation to the former vegetative cover.

Ongoing operational disturbance will be restricted to occasional maintenance activities as well as ongoing weed monitoring and management in rehabilitated areas. The Project area is already subject to irregular vehicle movements associated with cattle grazing activity. There are no impacts associated with the Project which are considered unpredictable or irreversible with regard to MNES values, or ecological values in generaL.

7.2 Proposed Mitigation Measures

The proponent will commit to a range of measures to minimise impacts to MNES, MSES and general ecological values associated with Study area. The final design process for the Project will reduce the area of impact to areas representing habitat for threatened species as much as is feasible for the construction of the required infrastructure. This has already been demonstrated through avoidance of vegetation clearing in remnant or regrowth vegetation communities and gilgai areas across the majority of the Project footprint and a commitment to underground pipeline installation at watercourse crossings (avoiding impacts to surface riparian vegetation and aquatic ecosystems). Where avoidance is not possible, a range of mitigation strategies will be implemented under an overarching Project Environmental Management Plan (EMP). The EMP is informed by a number of management plans relevant to ecological impacts including (but not limited to):

- Vegetation Clearing Management Plan

- Fauna and Pest Management Plan
- Weed Management Plan
- Soil and Erosion Management Plan
- Land Use Management Plan

The EMP and various sub-plans will comprise a range of measures that will mitigate potential impacts to ecological values as detailed in **Table 15**.

Table 15. Recommended mitigation measures proposed for general impacts resulting from Project works

Impact	Management measure	Project timing
Vegetation clearing	The Project will develop a Vegetation Clearing Management Plan prior to works being carried out. Vegetation clearing protocols will be established within the Plan and will include the following mitigations measures at a minimum.	Pre-construction
	Cleared paddocks and access tracks will be preferentially utilised for locating assets and tracks to minimise the extent of clearing	Prior to vegetation clearing
	Pre-clearance surveys will be carried out prior to undertaking clearing activities, by a suitably qualified and experienced person.	Pre-construction
	Where pre-clearance survey results in identification of sensitive ecological values such as threatened flora and fauna species, or threatened ecological communities, in order of preference: • adjust location to avoid ecological values • adjust the activity to prevent impact (e.g. change design or layout) • if there is no viable alternative, seek additional authorisation where that is appropriate, which may include offset conditions	Prior to vegetation clearing
	Project employees and contractors should be made aware of environmental obligations and compliance requirements through the induction program.	Project induction and training
	Vegetation clearing extents will be clearly demarcated with flagging or bunting prior to clearing to limit the area safely and reasonably required for permanent and temporary works	Prior to clearing
	Vegetation clearing will be limited to the minimum disturbance required for the construction phase. Rootstocks will remain in situ where no earthworks are required.	During vegetation clearing
	Pipeline crossings of defined watercourses will be via horizontal directional drilling to minimise the disturbance to riparian vegetation and aquatic habitat	Prior to vegetation clearing
	Any cleared vegetation will be stockpiled in windrows adjacent to the area of clearing. Reuse stripped topsoil in areas to be rehabilitated with similar topsoil characteristics if possible. If topsoil cannot be effectively reused immediately, stockpile ensuring the height of the stockpile is no more than 2 m.	During construction
	For any clearing of potential habitat (including vegetation or stockpiles of vegetation), the following will be implemented: • The potential habitat will be inspected by a suitably qualified and experienced person (i.e. licensed fauna spotter) to identify any fauna residing in the area • Clearing activities will only commence with verbal authorisation from the licensed fauna spotter • If fauna is present, the licensed fauna spotter will provide instructions to the Project Manager on appropriate action that may encourage the fauna to move of its own volition • In the event that fauna does not move, only the licensed fauna spotter will be authorised to collect the animal, in accordance with the Queensland code of practice for the welfare of wild animals affected by land-clearing and other habitat impacts and wildlife spotter/catchers (2009). The	At all times

Impact	Management measure	Project timing
	licensed fauna spotter must relocate the animal to the nearest available habitat (ideally adjacent to the area of clearing and outside the development footprint)	
Rehabilitation	Rehabilitation within the Project area will be managed as per the Rehabilitation Management Plan within the Project EMP.	Following construction
	Progressive rehabilitation of disturbed areas will be carried out as practicable, including reshaping significantly disturbed land to a stable profile and remediation of contaminated land.	At all times
	Re-establish surface drainage lines to prevent erosion and manage sedimentation, and restore natural hydrological function	At all times
	Reinstate top layer of soil profile to promote vegetation growth and prevent erosion	At all times
	Continue weed management protocols until a minimum of 70% native ground cover is achieved.	At all times
	Note where the land disturbed was previously used for cropping, the land will be returned to a suitable state to allow the landholder to continue cropping.	At all times
	Promote establishment of vegetation to stabilise soil and prevent erosion	At all times
	Regular maintenance of rehabilitated areas until performance standards are met.	At all times
Fauna mortality	A suitably qualified and experienced person (i.e. licensed fauna spotter) must be present during clearing of remnant vegetation to identity and relocate native fauna species.	Prior to vegetation clearing
	Fauna spotter-catchers (licensed) will inspect sites prior to vegetation clearing. Fauna habitat shelter features (large hollows) will be clearly marked where they are unable to be accessed/inspected prior to tree felling.	Prior to clearing
	Install appropriate fencing or cover of areas where fauna may be entrapped such as well infrastructure, dams or trenches.	During construction
	Fauna ramps must be installed in trenches a minimum of every 10 m apart, where trenches are required to remain open over night	During construction
	Any identified injured fauna must either be euthanised or transported to a local wildlife carer (if safe to do so) by a suitably qualified and experienced person (i.e. licensed fauna spotter). Liaise with local wildlife carers or veterinarians for appropriate treatment of injured animals	During construction
	A fauna register to record all fauna encountered during clearing works (as per fauna spotter-catchers) including fauna incidents (injuries and mortality) will be maintained during construction.	At all times
	Onsite speed limits (<50 km/h) will be established throughout Project area to limit the potential for road collisions. This speed limit is considered suitable as the Project area is flat with good visibility; the Proponent is utilising existing farm tracks; driving will only be in 4WD mode.	At all times
Threatened flora and fauna	Fauna and Pest Management Plan will be in place prior to construction works being carried out. Plan will establish species-specific management procedures for threatened species considered to be potentially or likely to be present in this report.	Pre-construction
	Cleared paddocks and access tracks will be preferentially utilised for locating assets and tracks to minimise impact to flora and fauna habitat	Prior to vegetation clearing
	Searches for threatened plant and fauna species will be carried out by a suitably qualified ecologist/fauna spotter-catchers as part of pre-clearance surveys in remnant vegetation.	Pre-construction
	Project inductions will outline species of significance that may occur on the project area.	Project induction and training

Impact	Management measure	Project timing
	Project employees will be required to notify fauna spotter/catchers when a species of significance is observed in the Project area. All encounters with a threatened species will recorded in the project fauna register maintained by the designated Environmental Officer.	At all times
	The final Project design process will incorporate components (mechanical) and design elements to reduce ongoing operational noise from permanent Project infrastructure that has potential to impact adjacent fauna habitat (such as the gas processing facility).	Final design
Noise and lighting	The final Project design process will incorporate the use of low light spill lighting components and directional lighting (away from adjacent fauna habitat) where night lighting is considered necessary.	Final design
	All Project-associated construction/operational machinery will be maintained as per manufacturer design specifications to ensure project noise is minimised.	At all times
	Monitoring of weather conditions will be carried out to inform Project activities and planning during high-wind weather conditions.	At all times
Airborne dust	Ensure employees made aware of potential dust generating activities and mitigation and management measures to prevent nuisance	At all times
	Monitoring of air/dust emissions will be carried out in accordance with regulatory requirements.	Pre-construction
	Minimise vegetation clearing and leave root stock in-situ where practicable to minimise potential for causing soil erosion and producing dust sources	At all times
	Where practicable, mulch cleared vegetation and spread as protective layer over exposed soil	At all times
	Dust from areas likely to be a source of airborne dust (such as tracks and topsoil stockpiles) will be suppressed during construction using water trucks/wetting to keep dust related impacts to a minimum. Water used for dust suppression will be obtained from Project-associated produced water where possible.	At all times
	Onsite speed limits (<50 km/h) will be established throughout Project area to limit the potential for road collisions. This speed limit is considered suitable as the Project area is flat with good visibility; the Proponent is utilising existing farm tracks; driving will only be in 4WD mode.	At all times
	Areas subject to vegetation clearing and no longer required for construction will be subject to vegetation reinstatement as soon as is practicable.	At all times
	Weed Management Plan and Fauna and Pest Management Plan will be in implemented prior to construction works being carried out. Plan will detail all required management measures and monitoring procedures.	Pre-construction
Weeds and pests	Mapping of the extent of weed/pest occurrence within the Project footprint will be recorded during pre-clearance surveys.	Pre-construction
	Weed awareness including in induction and tool box talks for all personnel	At all times
	Regular weed inspections will be carried out in areas of vegetation clearing	At all times
	Take prompt action to control any introduced species of pest animals, actions may include: • No domestic animals belonging to project personnel or subcontractors will be permitted on site • Covering and securing scrap kitchen • Direct pest control baiting and trapping (only if the specific species can be targeted) Weekly inspections of onsite project buildings/infrastructure (e.g. offices and workers accommodation) for sheltering feral predators (focused on cats)	At all times

Impact	Management measure	Project timing
	All plant and equipment moving mobilising to and demobilising from the site will be inspected for weed and seeds. If required plant and equipment will be cleared prior to mobilisation or demobilisation. Weed washdown procedures will be implemented where necessary when moving between properties	At all times
	Disposal and storage of putrescible wastes must be undertaken appropriately to ensure feral animals aren't attracted to the Project area.	At all times
	Storage of construction/operation materials carried out in a manner so as to not encourage the establishment of resident pest fauna.	At all times
	Control and manage pest infestations and outbreaks resulting from Project activities in consultation with relevant landowner/s.	At all times
	If a new weed infestation is reported or found, appropriate action to contain and eradicate will be implemented (in consultation with an ecologist). This will include (at a minimum) review of the Qld Department of Agriculture and Fisheries weed factsheets which provide advice on control methods including recommended herbicides and application rates. Available at: https://www.dpi.qld.gov.au/business-priorities/biosecurity/invasive-plants-animals/fact-sheets	At all times
Fire	Monitoring of weather conditions will be carried out to inform Project activities and planning during high fire-risk weather conditions.	At all times
	The Project will maintain communications with local representatives for the Queensland Fire and Emergency Services (QFES) regarding Project activities and bushfire hazard conditions.	At all times
	Appropriate fire breaks will be maintained around above ground Project infrastructure.	At all times
	Site will include designated smoking areas.	At all times
	Onsite fire-fighting equipment will be regularly maintained and staff training will be developed and implemented.	At all times
Surface water	Every stage of the Project will have a site specific erosion and sediment control plan (ESCP) developed and implemented in accordance with the *Best Practice Erosion and Sediment Control (International Erosion Control Association Australia, 2008* or later versions). Each ESCP will outline erosion and sediment controls with consideration to: • Quantification of potential soil loss • Catchment and sub-catchments • Slope lengths and gradients • Nearest waterway and drainage lines • Soil properties • Stage duration • Disturbance areas	Prior to vegetation clearing
	Vehicle crossings of watercourses will be designed and constructed in accordance with the accepted development requirements for waterway barrier works (DAF 2018) to minimise impacts to fish passage.	Final design
	Erosion and sediment control devices will be inspected following every rainfall event. Where maintenance to devices are required this will be completed immediately	Following rainfall event
	Avoid works during wet season or heavy erosive rainfall as much as practicable. Activities for construction of pipelines or access tracks or any other linear infrastructure in watercourses, will be undertaken in no or low flow conditions	During Construction
	Vegetation will not be cleared, nor fill placed in or within: • 200 m from any wetland, lake or spring; or	During Construction

Impact	Management measure	Project timing
	• 100 m of the high bank of any other watercourse	
	Routine, regular and frequent visual monitoring will be undertaken while construction work is carried out in a watercourse	During Construction
	Re-establish the bed and banks profile of any waterways or creeks disturbed by Project activities	During Construction
	Fuels and other flammable liquids will be stored and handled in accordance with *AS 1940:2004 – The storage and handling of flammable and combustible liquids*	During Construction
	Refuelling of plant and equipment will occur at least 30 m from a watercourse or other drainage feature	During Construction
	Hazardous and dangerous goods will be stored in bunded facilities located at least 100 m from a watercourse or other drainage feature	During Construction
	Spill response equipment (e.g. booms and absorbent materials) will be available at refuelling areas and other sites (where relevant). Staff will be trained in the appropriate use of spill response equipment.	At all times
	Onsite washdown areas for Project vehicles/machinery will be located and clearly demarcated to prevent contaminated run-off from entering waterways.	At all times
	Wherever possible watercourse crossing will avoid instream works including through the use of directional drilling to locate pipelines under the watercourse. Where this is not possible (such as for new access tracks) works within a watercourse will be conducted in the following order of preference: • Conducting works when no water is present • Conducting works in times of no flow Conducting works in times of flow but in a way that does not negatively impact the flow of water within the watercourse, permanently impound water or permanently divert the flow of water	At all times

8 RISK ASSESSMENT

A hazard and risk assessment was undertaken in accordance with AS/NZS ISO 31000:2018 Risk Management – guidelines and HB203:2006 Environmental risk management principles and processes, to provide an assessment of the potential risks from the project's activities (refer **Section 7.1**) to the Environmental Values identified as present in this report, following the application of project-specific mitigation measures (refer **Section 7.2**)

8.1 Project Risk Assessment Method

The criteria adopted for assessing risk levels of identified hazards is shown in **Table 16**. Analysis of the consequence and likelihood was conducted to determine the risk rating given against each hazard (refer **Table 17** and **Table 18**). The risk assessment matrix in **Table 19** is a summary of the hazard and risk assessment findings for all stages of the Project (pre-construction, construction, operation, decommissioning).

Table 16. Risk Assessment Criteria

Likelihood	Consequence				
	Extreme 5	Major 4	Moderate 3	Minor 2	Insignificant 1
Almost Certain 5	Extreme (25)	Extreme (20)	Extreme (15)	High (10)	Moderate (5)
Likely 4	Extreme (20)	Extreme (16)	High (12)	Moderate (8)	Low (4)
Possible 3	Extreme (15)	High (12)	Moderate (9)	Moderate (6)	Low (3)
Unlikely 2	High (10)	Moderate (8)	Moderate (6)	Low (4)	Low (2)
Rare 1	Moderate (5)	Low (4)	Low (3)	Low (2)	Very low (1)

Table 17. Likelihood Scale

Level	Description	Definition
1	Rare	Unlikely to occur during a lifetime or very unlikely to occur
2	Unlikely	Could occur about once during a lifetime or more likely not to occur than to occur
3	Possibility	Could occur more than once during Project lifetime or more likely not to occur than to occur
4	Likely	Will probably occur in most circumstances
5	Almost Certain	Is expected to occur in most circumstances

Table 18. Consequence Scale

Level	Description	Definition
1	Insignificant	• Very low level environmental impacts confined to a small area within the project area • Prompt clean-up/restoration of environmental values • Negligible potential for negative media coverage
2	Minor	• Low environmental impact confined within the project area • Short-term clean-up/restoration of environmental values • Regulation breaches without fine or litigation • Negative local media coverage possible • Complaint from community
3	Moderate	• Moderate but reversible offsite environmental impacts, requiring short-term clean-up (weeks) • Onsite (within Project area) medium term impact requiring clean-up/restoration of • environmental values • Regulation breaches resulting in fine or prosecution • Negative media coverage at local/regional level over more than one day with resulting impact to social/environmental capital
4	Major	• Major, offsite, environmental impacts requiring medium-term clean-up (months) • Onsite impact with irreversible residual damage or requiring significant clean-up effort (years) • Substantial impact to social/environmental capital, will attract public concern • Major litigation at operation level • Negative national media coverage
5	Extreme	• Prolonged or severe, offsite or regional environmental impacts requiring long-term clean-up (years) with irreversible residual damage • Extreme permanent loss of social/environmental capital, with anticipated major public outrage • Major litigation or prosecution at parent company level • Loss of environmental licence

8.2 Project Risk Assessment Findings

To quantify the potential for an impact to cause harm, a qualitative environmental risk assessment was undertaken using the ISO 31000:2009 Risk Management – Guidelines and HB 203:2012 Managing environment-related risk. The analysis outlines the risks associated with hazards identified in **Section 7.1**, using the risk criteria (consequence and likelihood) to allocate a risk rating for the hazard.

The risk assessment process was undertaken on both unmitigated risks and residual (mitigated) risks. This identified where additional management controls were needed to ensure the impacts and risks are as low as reasonably practical. **Table 19** provides a summary of the project risks.

Table 19. Project risk assessment - ecological matters

Hazard / Project phase	Potential impacts	Risk rating (unmitigated)	Mitigation measures	Residual risk rating
Vegetation clearing – native vegetation Construction phase	• The total area of the Project disturbance area is 178.27 ha and may result in clearing a maximum of 1.28 ha of remnant vegetation. Resulting impacts include: a) Loss of threatened TECs and flora species listed under EPBC Act b) Loss of native vegetation c) Loss of ecosystem function	**Moderate (8)**	• Project design has utilised further refinement to avoid occurrences of TECs and endangered vegetation • Prior to construction project design may be refined further to minimise vegetation clearing footprint • Vegetation located adjacent to the project construction works will be appropriately marked to avoid unnecessary clearing/vegetation damage • Carry out pre-clearance protected plant surveys and use results to refine project design avoid clearing threatened flora • Progressive rehabilitation of areas cleared for construction but not required for operation will be undertaken as project progresses • Rehabilitation will be completed to the standards required of the Project EMP and Queensland permit conditions	**Low (4)**
Vegetation clearing – threatened native fauna habitat Construction phase	• The current Project layout may result in clearing remnant/regrowth vegetation suitable for the following threatened fauna species considered likely or possibly occurring in Study area: a) Ornamental Snake – 0.89 ha b) Grey Snake – 0.89 ha c) Australian Painted Snipe – 0.89 ha d) Sharp-tailed Sandpiper – 0.89 ha e) Latham's Snipe – 0.89 ha f) Koala – 1.28 ha g) Squatter Pigeon – 1.28 ha	**Moderate (8)**	• Project design has utilised further refinement to minimise vegetation clearing footprint • Measures in place within Fauna Management Plan including carry out pre-clearance surveys and (where possible) use results to refine project design avoid clearing identified threatened fauna habitat/sites • Vegetation located adjacent to the project construction works will be appropriately marked to avoid unnecessary clearing/vegetation damage • Progressive rehabilitation of areas cleared for construction but not required for operation will be undertaken as project progresses • Rehabilitation will be completed to the standards required of the Project EMP and Queensland permit conditions	**Low (4)**

Hazard / Project phase	Potential impacts	Risk rating (unmitigated)	Mitigation measures	Residual risk rating
			For any clearing of potential habitat (including vegetation or stockpiles of vegetation), the following will be implemented: • The potential habitat will be inspected by a suitably qualified and experienced person (i.e. licensed fauna spotter) to identify any fauna residing in the area • Clearing activities will only commence with verbal authorisation from the licensed fauna spotter • If fauna is present, the licensed fauna spotter will provide instructions to the Project Manager on appropriate action that may encourage the fauna to move of its own volition • In the event that fauna does not move, only the licensed fauna spotter will be authorised to collect the animal, in accordance with the Queensland code of practice for the welfare of wild animals affected by land-clearing and other habitat impacts and wildlife spotter/catchers (2009). The licensed fauna spotter must relocate the animal to the nearest available habitat (ideally adjacent to the area of clearing and outside the development footprint) •	
Vegetation clearing - loss of potential breeding/roosting habitat Construction phase	• Loss of potential breeding and resting sites for fauna including large tree hollows, fallen timber • Remnant vegetation throughout much of the Project area has been subject to past tree clearing/thinning. Large trees retaining large tree hollows used as potential breeding/roosting sites for a range of larger fauna are generally uncommon in the Study area	**Moderate (6)**	• Project design has been adjusted to avoid riparian vegetation featuring large hollow-bearing trees via underground drilling at watercourse crossings • No unnecessary clearing of vegetation or damage to adjacent vegetation • Fallen timber created by vegetation clearing should be scattered in adjacent habitats to provide offsite shelter habitat for fauna • Progressive rehabilitation of areas cleared for construction but not required for operation will be undertaken as project progresses	**Low (3)**

Hazard / Project phase	Potential impacts	Risk rating (unmitigated)	Mitigation measures	Residual risk rating
			• Rehabilitation will be completed to the standards required of the Project EMP and Queensland permit conditions	
Habitat fragmentation and connectivity Construction and operation phase	• The Project footprint is largely restricted to small areas (up to 1 ha for well pads) and narrow linear clearing (18 m wide disturbance corridor including 6 m for access tracks) impacts which largely occur in cleared lands • Much of these areas are not required for operation and will be rehabilitated on completion of construction. • The Queensland Landscape Fragmentation and Connectivity Tool identified no significant impact on connectivity area	**Low (3)**	• Progressive rehabilitation of areas cleared for construction but not required for operation will be undertaken as project progresses, thus reducing impacts to connectivity • Rehabilitation will be completed to the standards required of the Project EMP and Queensland permit conditions	**Low (3)**
Fauna mortality – vegetation clearing Construction phase	• Accidental death of resident fauna during vegetation clearing	**Moderate (9)**	• Very little woody vegetation to be impacted by Project footprint • Progressive rehabilitation of areas cleared for construction but not required for operation will be undertaken as project progresses, thus reducing impacts to connectivity • Rehabilitation will be completed to the standards required of the Project EMP and Queensland permit conditions	**Low (4)**
Fauna mortality – vehicle strike and trenching Construction phase	• Accidental death of resident fauna due to Project associated vehicle strike (increase in local vehicle traffic) • Accidental death caused by overnight entrapment during	**High (12)**	• Appropriate site speed limits set and enforced • Majority of construction personnel to stay in onsite accommodation (reducing site travel requirements) • Open trenches to be inspected by a suitably experienced fauna spotter catcher prior to works being carried out each morning	**Low (4)**

Hazard / Project phase	Potential impacts	Risk rating (unmitigated)	Mitigation measures	Residual risk rating
	trenching works for pipeline activities		• Staff and contractors educated on site values under project inductions and ongoing safety activities, and • Monitoring/recording of fauna injury/mortality events to remediate 'high risk' areas	
Airborne dust Construction phase	• Dust escaping onto adjacent habitat and settling on plants due to earthworks and vehicle traffic. Dust generated by vehicles that settles on plants may interfere with plant health and community structure (although impact uncertain).	**Moderate (6)**	• Monitoring of weather conditions to guide project activities during dry, windy conditions • Monitoring of air/dust emissions will be carried out in accordance with regulatory requirements • Progressive rehabilitation to limit exposed land • Water truck to be used for dust suppression where deemed necessary during construction • Vehicle speeds to be reduced to 50 km/h on unsealed roads	**Low (4)**
Noise - created by Project activities Construction and Operation phase	• Noise may negatively impact on fauna behaviour and physiology • Impact likely to be localised (to area of noise source), response will be species-specific, and potentially temporal (individuals may become accustomed to ongoing noise), and • Construction noise will be temporary with major operation noise restricted to gas processing facility area located in cleared habitat	**Moderate (6)**	• Final design will incorporate noise management strategies where possible (with regard to design of permanent gas processing facility and water management plant) • Vehicle speed limits implemented across site to reduce noise levels • Training on noise mitigation strategies will be undertaken • Regular service and maintenance of equipment/machinery - excessively noisy plant will be tagged out and repaired immediately	**Low (3)**
Lighting Construction and operation phase	• Artificial lighting may negatively impact on fauna behaviour and physiology • Impact likely to be localised (to area of light source), and response will be species-specific • Major ongoing operational source of lighting impact restricted to gas processing facility located in cleared lands	**Moderate (6)**	• Final design will incorporate light management strategies where possible (with regard to design of permanent gas processing facility and water management plant) • Project lighting will be minimised (low luminance) as far as possible and directed away from fauna habitat • Construction is expected to be carried out largely during daylight hours • Night lighting will be lights required for safety and security	**Low (3)**

Hazard / Project phase	Potential impacts	Risk rating (unmitigated)	Mitigation measures	Residual risk rating
Weeds and pests Construction and operation phase	• Project vehicles/plant may introduce and spread weed seeds • Vegetation clearing within native vegetation, although minor in extent, may favour the establishment of weeds in native habitats due to increased light/soil disturbance, and • Project infrastructure and food waste may favour the establishment of resident populations of feral predators	**High (12)**	• Weed and pest management will form part of the Project EMP and be implemented over the life of the project • Project employees and contractors will be made aware of obligations related to weed and food waste management through a site induction program • Vehicles to be washed and certified clean prior to arrival onsite • All machinery and equipment brought to the site will be cleaned • Minimise the use of off-road vehicle movements • Implementation of erosion and sediment control measures to minimise the risk of weed seed washing into local watercourses • Areas subject to vegetation clearing should be subject to regular weed inspections and new weed infestations should be recorded and controlled • Infestations of weeds/pests listed as Restricted Matters (as listed under the Biosecurity Act) and WoNs onsite will only be dealt with and/or disposed of in a way prescribed under regulation and/or as recommended by DAF Take prompt action to control any introduced species of pest animals, actions may include: • No domestic animals belonging to project personnel or subcontractors will be permitted on site • Covering and securing scrap kitchen • Direct pest control baiting and trapping (only if the specific species can be targeted) • Weekly inspections of onsite project buildings/infrastructure (e.g. offices and workers accommodation) for sheltering feral predators (focused on cats) •	**Moderate (6)**

9 SIGNIFICANT RESIDUAL IMPACT ASSESSMENT – MNES AND MSES

9.1 Matters of National Environmental Significance Assessment

The EPBC Act defines and protects nine matters considered to be of MNES. Under Part 3 of the EPBC Act, a person must not undertake an action that will have, or is likely to have, a significant impact on a protected matter, without approval from the Minister.

Two TECs, 11 threatened species and four bird species listed as Migratory under the EPBC Act have some potential to occur in the Study area (refer **Table 9** and **Table 11**) comprising the following MNES:

- Known to occur:
  - Brigalow TEC – Endangered
  - SEVT TEC - Endangered
  - White-throated Snapping Turtle – Critically Endangered

- Likely to occur
  - Annual wiregrass – Vulnerable
  - Ornamental Snake – Vulnerable
  - Koala – Endangered

- Possibly occurs - flora:
  - Ooline - Vulnerable

- Possibly occurs - fauna:
  - Australian Painted Snipe – Endangered
  - Latham's Snipe – Vulnerable, Migratory
  - Sharp-tailed Sandpiper - Vulnerable, Migratory
  - Squatter Pigeon (southern) – Vulnerable
  - Painted Honeyeater - Vulnerable
  - Grey Snake – Endangered

- Possibly occurs - migratory
  - Glossy Ibis
  - Gull-billed Tern
  - Caspian Tern
  - Fork-tailed Swift

An assessment of the potential for significant impacts resulting from the Project activities was carried out only on those MNES considered as potentially subject to substantial impacts. The assessments have been carried out in accordance with the *MNES significant impact guidelines 1.1* (MNES Guidelines) (DE 2013a)

The gas field disturbance footprint largely avoids impacts woody vegetation. As stated previously (refer **Section 7.1.1**) the impact assessment does not include an assessment of the potential impacts associated with the export pipeline.

9.1.1 MNES Not Subject to Significant Impact Assessment

The current layout of the gas field infrastructure impacts a maximum of 1.28 ha of remnant woodland largely comprising Poplar Box woodland (RE 11.5.3). Impacts on riparian vegetation (RE 11.3.25) associated with a drainage line in the east of the Project will be minimised through the use of directional drilling for pipeline installation (refer **Table 13**). All occurrences of Brigalow TEC and SEVT TEC have been avoided and no potential for significant impacts are considered possible.

White-throated Snapping Turtle was recorded to the immediate west of the Study area at a waterhole on the Comet River. There is no suitable habitat present within the Study area itself which comprises ephemeral

waterways including Humboldt Creek. No activities associated with the Project will impact the Comet River, either through direct disturbance or indirectly (no impact to habitat or water quality values). The species will not be impacted by the Project.

Impacts to fauna associated with the presence of woody vegetation include the following species: Squatter Pigeon (southern). The species occurs across a very large area within central Queensland. The Project proposes to clear a maximum of 1.17 ha of potential habitat for the species. There is abundant identical habitat remaining in the Study area which will not be impacted. The potential impact on Squatter Pigeon is considered very minor at worst and it is not assessed further. Brigalow communities as well as other acacia dominant communities provide the preferred habitat supporting the mistletoe species associated with Painted Honeyeater. No Brigalow communities will be impacted and as such, there are no impacts expected on this species.

Ooline is known from Cape York Peninsula, including sites near Musgrave, the Irvineband to Petford area, and south-west of Mt Garnet (DEWHA 2008). Suitable habitat for the species occurs throughout the Study area in the form of Brigalow and to a lesser extent Poplar box dominated woodland and open-forest. The species is distinctive (i.e readily observable where it occurs) and was not observed during project field surveys. The only suitable habitat for the species within the disturbance footprint is provided by remnant RE 11.5.3 (Poplar Box woodland) with a total area of 1.17 ha occurring within the disturbance footprint. Brigalow communities which are more likely to support the species have been avoided. The extent of disturbance is considered negligible given the species was not observed within the disturbance footprint.

Annual Wiregrass is restricted to central Queensland in the Emerald and Springsure districts where it is known to occur in eucalypt woodlands (with *Eucalyptus orgadophila*) and natural grasslands on basalt derived black clay soils (DE 2014a). The species was not detected within the Study area during field surveys but is considered a possible occurrence within the Study area. Potential habitat for the species within the Study area is considered to be restricted to Brigalow habitats on land zone 4 (RE 11.4.7, 11.4.8 and 11.4.9). These communities have been avoided and no impact on the species is expected.

There is a possibility for a number of threatened and migratory wetland-associated bird species to be present. The Project will not impact any of the existing waterbodies, including several farm dams of various sizes, within the Study area. Gull-billed Tern or Caspian Tern will not be impacted by the Project as a result. Following heavy rainfall events three of the species (Sharp-tailed Sandpiper, Latham's Snipe and Glossy Ibis) may also have a low potential to use water-filled gilgais within the Study area although no migratory species were identified during either Project survey. Any potential impacts on these species are considered to be of a very minor risk and managed under general mitigation measures outlined in **Section 7.2**.

Fork-tailed Swift is an aerial species that may occur over any habitat including inland, coastal and marine areas and disturbed habitat such as urban areas. It has only occasionally been recorded as landing in Australia. The species is highly mobile and may forage anywhere from 1 m up to 100s of metres above ground (Higgins 1999; DCCEEW 2023). Given the species' aerial habits it is inconceivable the Project area would represent 'important habitat' (as defined in DE 2013a) for the species and the Project activities would be highly unlikely to impact the species in any way.

9.1.2 Significant Impact Assessment – Threatened Species

With regard to species listed as vulnerable the significant impact assessments commence with an evaluation of the likely importance of the population of vulnerable fauna species associated with the Project area and immediate surrounds. Under four of the nine assessment criteria identified within the MNES guidelines, vulnerable species are considered as subject to significant impacts when an 'important population' is impacted.

An 'important population' for vulnerable species as defined within the MNES guidelines is as follows:

- 'An important population is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:
  - Key source populations either for breeding or dispersal
  - Populations that are necessary for maintaining genetic diversity and/or

- Populations that are near the limit of the species range

Given the specificity of the above definition and the often scarce ecological information and occurrence records available for many threatened species and populations in Australia, it is difficult to determine either of:

- Attributes such as breeding and dispersal behaviour and whether the population is a 'key source' or
- The genetic diversity of individuals inhabiting a regional population or sub-population

A single assessment criterion (for vulnerable, endangered and critically endangered species) refers to impacts on 'habitat critical to the survival of a species or ecological community' which is defined under the MNES Guidelines as areas that are necessary:

- For activities such as foraging, breeding, roosting, or dispersal
- For long-term maintenance of the species or ecological community
- To maintain genetic diversity and long-term evolutionary development and/or
- For the reintroduction of populations or recovery of the species or ecological community

Such habitats may be, but are not limited to:

- Habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community

Many species do not have approved recovery plans and 'habitat critical to the survival of a species' is generally not identified in available literature. For species that have a wide distribution/occurrence, habitat considered as that necessary for 'foraging, breeding, roosting or dispersal' is a broad definition that is not necessarily analogous with the definition of critical at a species level. Given the relative lack of information that is often available, significance of impacts to threatened species has been based on the professional expertise of the assessment team and the latest available information relating to species habitat and ecological requirements and distribution.

Assessment of the significance of impact in accordance with the criteria contained within the MNES Guidelines has been undertaken for the six threatened species that are considered to be likely or possibly occurring and potentially subject to substantial impacts from the Project. The significant impact assessments are provided in the following sections covering species information relevant to the assessment and an assessment table using the criteria set out in the MNES Guidelines.

Under the assessments, a significant impact is not considered to be likely to occur as a result of the Project activities.

9.1.2.1 Ornamental Snake – Vulnerable

Ecology

Ornamental Snake is largely restricted to low-lying areas with deep-cracking clay soils, which are subject to seasonal flooding, and adjacent areas of clay and sandy loams. Habitat includes woodland and shrubland, such as Brigalow, and riverine habitats, where the species lives in soil cracks and under fallen timber (Ehmann 1992; Wilson & Swan 2010). The species may be found in areas of simple habitat structure, such as paddocks, grasslands and regrowth if frogs are present (Melzer 2012).

The species apparently feeds exclusively on frogs (Wilson & Swan 2017) and can change from being abundant to absent over a few hundred metres due to changes in soil type or topography (Swan & Wilson 2008). Recent collecting from large-scale trenches for pipelines has shown the species to be much more common than previously thought (Swan & Wilson 2012).

Association with Study area

Not recorded during surveys for the Project despite ideal conditions occurring during the January-February survey period (i.e. frog prey abundant and active, waterbodies commonly present and warm humid nights). There are three database records located within 50 km of the Study area. The nearest of these is from 1995 and located 22 km north but appears to be erroneously located based on the site information associated with

the record. There are two other records to the north-west and south which are at least 40 km from the Project.

Targeted surveys for Ornamental Snake in the area have been carried out in the local region in recent years including the following:

- Ecological reporting for the Mahalo Gas Project (Golder 2018) – included targeted nocturnal surveys across three properties. Four sites located on Struan property to the immediate south of Meroo Downs (6 hours of survey effort – two personnel). Ornamental Snake (14 individuals) recorded to the south-east of the Study area on Humboldt and Somerby properties (7 km south-east and 10 km south of the eastern extent of the Study area respectively) (refer Figure 5 and Figure 14 in Golders 2018 for survey sites and species record locations).
- Ecological reporting for the Blackwater South Project (EMM 2022) – included targeted nocturnal surveys, pitfall and funnel trapping lines and active targeted searches (spotlighting and habitat searches) for Ornamental Snake. Four trap sites and six targeted Ornamental Snake sites located on Togara encompassing the eastern portion of the current Study area. Also, several sites to the immediate east on Memooloo property. Ornamental Snake (16 individuals across two survey periods in 2019 and 2020) recorded to the east and south-east of the eastern extent of the Study area. Not recorded within current Study area. Two individuals recorded 2 km east of the Study area (approximate locations shown on **Figure 10**) (refer Figure 5.1 and Figure 5.4 in EMM 2022 for survey sites and all species record locations).

There is abundant potential habitat present for the species on Togara property in the form of scattered gilgais on cracking clay soils. Some areas appear to have been subject to limited ploughing and soil surface structure was often affected by cattle compaction. Potential habitat is not considered to occur on Meroo Downs which has been subject to intensive land management and has eliminated gilgai structures on the property. An indicative map of potential habitat for Ornamental Snake within the Study area has been developed based on habitat features observed during onsite habitat assessments (i.e. presence of gilgais and cracking clay soils) and analysis of aerial imagery (refer **Figure 10**).

Nevertheless, it is noted the species was not observed despite ideal survey conditions in January-February 2023. It is also noted Cane Toads were abundant throughout the Study area.

DCCEEW approved species documents

There is no approved recovery plan for the species and no adopted threat abatement plan is considered relevant to the species. The Approved Conservation Advice (DE 2014b) for the species notes the following potentially threatening processes considered relevant to Ornamental Snake:

- Habitat loss and fragmentation due to land clearing (past and present)
- Habitat degradation caused by feral pigs
- Poisoning through ingestion of Cane Toads

There are no identified important populations or definitions of habitat critical to the survival of the species. The *Draft referral guidelines for the nationally listed Brigalow Belt reptiles* (Referral guidelines) (DSEWPC 2011) considers the presence of important habitat for this species a surrogate for an important population. The Study area is mapped as occurring within the known/likely distribution of the species (DCCEEW 2023). Important habitat is described as 'gilgai depressions and mounds' which occur within the Study area. Given gilgais occur the Study area has potential to comprise important habitat for the species under this definition.

The Referral guidelines notes that clearing of two or more hectares of important habitat may comprise a high risk of a significant impact on the species. The Project habitat mapping for the species (refer **Figure 10**) indicates there is potentially 1,513 ha of suitable habitat within the Study area. The Project layout currently proposes to impact up to 0.89 ha of cleared gilgai habitat which represents only 0.058% of the mapped habitat occurring within the Study area. At this stage it is predicted that four production wells will be drilled each year limiting the overall impact at any one time.

Much of the overall construction disturbance area will be reinstated following completion of construction. Well pads will be reduced from a 1 ha disturbance area to 0.04 ha of operational area with the remainder subject to revegetation. The layout of the gathering pipeline disturbance has been subject to revision in order to minimise impact on the identified gilgai habitat and will be restricted to a width of 6 m in these areas.

Table 20 provides an assessment of the potential for significant impacts on Ornamental Snake from the Project activities using the assessment criteria for vulnerable species outlined in the MNES Guidelines.

Table 20. Significant impact criteria assessment: Ornamental Snake

Criteria	Vulnerable species assessment
Lead to a long-term decrease in the size of an important population of the species	Ornamental Snake was not recorded within the Study area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). This includes records located 2-2.5 km east of the Study area. Habitat mapping indicates there is 1,513 ha of gilgai habitat present within the Study area which may be suitable for the species (refer **Figure 10**). Important habitat is considered a surrogate for an important population of the species and may be considered as present. The disturbance footprint will impact a maximum area of 0.89 ha of gilgai habitat over the operational life of the Project. The Project has avoided areas of extant Brigalow communities comprising gilgai habitat. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Following well construction at a site any further disturbance will be negligible. Construction noise/vibration disturbance will be localised and temporary. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to a long-term decrease in the size of an important population of Ornamental Snake.
Reduce the area of occupancy of an important population	Ornamental Snake was not recorded within the Study area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects. Important habitat for the species may be considered as present. The disturbance footprint will impact a maximum area of 0.89 ha of suitable habitat over the operational life of the Project. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to reduce the area of occupancy of an important population of Ornamental Snake to the extent a significant impact would be incurred on the species.
Fragment an existing important population into two or more important populations	Ornamental Snake was not recorded within the Study area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects. Important habitat for the species may be considered as present. The Project disturbance footprint occupies scattered locations within the Study area, much of which will be revegetated following construction completion. The Project will not fragment an existing important population of the species.
Adversely affect habitat critical to the survival of the species	There is no definition of critical habitat for the species. Important habitat is considered as present in the form of gilgai depressions. The disturbance footprint will impact a maximum area of 0.89 ha of gilgai habitat over the operational life of the Project, much of which will be revegetated following construction completion. Habitat mapping indicates there is 1,513 ha of cleared gilgai habitat within the overall Study area. The Project is considered unlikely to affect habitat critical to the survival of the species to the extent a significant impact would be incurred on the habitat present in the Study area.
Disrupt the breeding cycle of an important population	Ornamental Snake was not recorded within the Study area during Project surveys despite ideal conditions for detecting the species. Ornamental Snake has been recorded in the wider area during recent surveys for other projects. Important habitat for the species may be considered as present. The breeding biology of the species is little known. The disturbance footprint will impact a maximum area of 0.89 ha of suitable habitat over the operational life of the Project. It is predicted that four

Criteria	Vulnerable species assessment
	production wells will be drilled each year thereby limiting the overall extent of impact at any one time. These occur in scattered locations within the Study area. While there may be some potential for the Project to disrupt the breeding cycle of individuals of the species (should it be found to be present) it will not be to the extent a population would be significantly impacted.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	Important habitat for the species may be considered as present. The disturbance footprint will impact a maximum area of 0.89 ha of suitable habitat over the operational life of the Project. The Project has avoided areas of extant Brigalow communities comprising gilgai habitat where possible. The Project disturbance footprint occupies scattered locations within the Study area, much of which will be revegetated following construction completion. The Project is considered unlikely to impact the availability or quality of habitat present to the extent the species would decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species habitat	Cane Toads were observed to be abundant and are a known threat to Ornamental Snake. Evidence of feral pigs was observed in the Study area and is also considered a threat to the species. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Project area or surrounds.
Introduce disease that may cause the species to decline	There are no identified introduced diseases or pathogens associated with this species. The Project activities do not require the importation of soils or other biological matters into the Project area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere substantially with the recovery of the species	The Approved Conservation Advice for the species identifies the following priority actions as relevant for Ornamental Snake: • Monitor known populations, key habitat and conservation areas and the effectiveness of any implemented management actions • Identify high conservation value populations and investigate conservation arrangements on public and private lands • Minimise adverse land use impacts at sites where the species is known to occur • Manage the impact of feral pigs where the species is known to occur • Develop and implement a Cane Toad management plan for the region (DE 2014b) There is no conceivable reason the Project's activities would interfere with any of the management priorities identified above. The project's disturbance footprint with regard to potential habitat for the species is relatively minor. The Project will not interfere with the recovery of the species.
Assessment result	The species has not been recorded within the Study area but important habitat is considered as potentially occurring. The Project's extent of impact to suitable habitat comprising gilgais in cleared lands is minor given the extent of habitat present within the Study area. Based on the assessment above it is considered unlikely a significant to Ornamental Snake will occur as a result of the Project.

Figure 10. Study area mapping of gilgai habitat potentially suitable for Ornamental Snake, Grey Snake and Australian Painted Snipe

9.1.2.2 Grey Snake - Endangered

Ecology

Grey Snake occurs in central inland New South Wales, in south-east Queensland and north to Rockhampton in central Queensland. The species is largely confined to the Brigalow Belt bioregion and, although sparsely distributed, can be locally common (Hobson 2012). The species occurs on floodplains (Ehmann 1992) and is often found in seasonally inundated areas, preferring cracking, flood-prone clay or loam soils and areas with gilgais. Habitats include grassland and woodlands such as Brigalow, Belah and Poplar Box (Hobson 2012). The species is often found in riverine habitats near watercourses and natural levees (Ehmann 1992). Grey snakes also inhabit dry eucalypt forest and occasionally pasture (Covacevich & Wilson 1995). Although the species shows some tolerance for such cleared or modified habitats, some regrowth has been present for most records from such habitat (Hobson 2012).

Grey Snakes are crepuscular and nocturnal frog-eating specialists (Wilson & Swan 2017), that occasionally also eat lizards (Ehmann 1992). Individuals are usually found under fallen or embedded logs and flood debris or in soil cracks and burrows, generally near waterbodies (Ehmann 1992; Richardson 2008; Hobson 2012). They are known to give birth to up to 16 live young (Ehmann 1992), but little else is recorded of their breeding biology.

Association with Study area

The species was not recorded during surveys for the Project or for other projects in the local region (Golder 2018; EMM 2022). There is a 2003 record located 38 km north of the Study area. There is a record of uncertain origin located 127 km north north-west of the Study area. The validity of these records cannot be verified. All other records are from the Rockhampton area (>190 km east) or much further south around Roma and Miles (>270 km from the Study area). The distribution of the species appears uncertain and dispersed. The Approved Conservation Advice for the species (DCCEEW 2022) notes almost all Queensland records are from the southern Brigalow Belt on the Condamine and Macintyre River floodplains, the Darling Downs and Lockyer Valley in south-east Queensland, Currawinya area in south-west Queensland and near Rockhampton.

Commonwealth Government habitat mapping indicates the species 'may occur' within the Study area (rather than being likely to occur). There is substantial gilgai habitat present within the Study area. However, it is noted woody regrowth in this habitat largely only occurs as scattered individual trees or very small patches. In general, the gilgai habitat remains cleared of overhead vegetation which the species appears to prefer.

DCCEEW approved species documents

There is no approved recovery plan for the species and no adopted threat abatement plan is considered relevant to the species. The Approved Conservation Advice (DCCEEW 2022) for the species notes the following potentially threatening processes considered relevant to Grey Snake:

- Habitat loss and fragmentation due to land clearing, agriculture and grazing impacts
- Diversion of water for irrigated agriculture
- Pesticide and herbicide use on floodplains
- Predation by feral pigs, cats and Red Fox
- Poisoning through ingestion of Cane Toads
- Coal and gas extraction developments
- Increased fire frequency

There are no identified important populations or definitions of habitat critical to the survival of the species. There is suitable gilgai habitat present within the Study area although much of this lacks the woody cover the species is associated with. The actual occurrence of the species in the region is uncertain.

The extent of gilgai habitat within the Study area has been depicted in **Figure 10** and indicates there is potentially 1,513 ha of suitable habitat within the Study area. The Project layout currently proposes to impact up to 0.89 ha of cleared gilgai habitat which represents only 0.058% of the mapped habitat occurring within the Study area. At this stage it is predicted that four production wells will be drilled each year limiting the overall impact at any one time.

Table 21 provides an assessment of the potential for significant impacts on Grey Snake from the Project activities using the assessment criteria for Endangered species outlined in the MNES Guidelines.

Table 21. Significant impact criteria assessment: Grey Snake

Criteria	Endangered species assessment
Lead to a long-term decrease in the size of a population of the species	The species has not been recorded within the Study area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. Almost all Queensland records are from the southern Brigalow Belt on the Condamine and Macintyre River floodplains, the Darling Downs and Lockyer Valley in south-east Queensland, Currawinya area in south-west Queensland and near Rockhampton (DCCEEW 2022). There is substantial gilgai habitat present within the Study area, although In general, the gilgai habitat remains cleared of the overhead woody vegetation the species is thought to prefer. The disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life of the Project. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Following well construction at a site any further disturbance will be negligible. Construction noise/vibration disturbance will be localised and temporary. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to a long term decrease in the size of a population of Grey Snake.
Reduce the area of occupancy a population	The species has not been recorded within the Study area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. Almost all Queensland records are from scattered areas much further south or east of the Study area. The disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life of the Project. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to reduce the area of occupancy of a population of Grey Snake.
Fragment an existing population into two or more populations	The species has not been recorded within the Study area and has not been recorded in the wider area during recent surveys for other projects (Golders 2018; EMM 2022). There is no evidence a population occurs in the region. Almost all Queensland records are from much further scattered areas much further south or east of the Study area. The Project disturbance footprint occupies scattered locations within the Study area, much of which will be revegetated following construction completion. The Project will not fragment an existing population of the species.
Adversely affect habitat critical to the survival of the species	There is no evidence habitat critical to the survival of the species is present. The disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life of the Project. Habitat mapping indicates there is over 1,513 ha of cleared gilgai habitat within the overall Study area. The Project is considered unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	The species has not been recorded within the Study area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. The breeding biology of the species is little known. The disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. These occur in scattered locations within the Study area. While there may be some potential for the Project to disrupt the breeding cycle of individuals of the species (should it be found to be present) it will not be to the extent a population would be significantly impacted.
Modify, destroy, remove, isolate or decrease the availability or quality of	The species has not been recorded within the Study area and has not been recorded in the wider area during recent surveys for other projects (Golder 2018; EMM 2022). There is no evidence a population occurs in the region. The disturbance footprint will impact a maximum area of 0.89 ha of low value gilgai habitat over the operational life

Criteria	Endangered species assessment
habitat to the extent that the species is likely to decline	of the Project. The Project disturbance footprint occupies scattered locations within the Study area, much of which will be revegetated following construction completion. The Project is considered unlikely to impact the availability or quality of habitat present to the extent the species would decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat	Cane Toads were observed to be abundant and are a known threat to Grey Snake. Feral cat was observed in the Study area and is also considered a threat to the species. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Project area or surrounds. The Project will not impact the availability or quality of habitat present to the extent the species would decline.
Introduce disease that may cause the species to decline	There are no identified introduced diseases or pathogens associated with this species. The Project activities do not require the importation of soils or other biological matters into the Project area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere with the recovery of the species	The Approved Conservation Advice for the species identifies the following conservation and management priorities as relevant for Grey Snake: • Undertake surveys and population monitoring across the species distribution in both known occupied areas and areas in which the species hasn't been recorded • Protect the species habitat from degrading agricultural practices, and the impacts of cattle and feral pigs • Investigate the hydrological requirements to sustain the species habitat and ensure future development maintains hydrological interchange across populations • Ensure land managers target feral pig management • Protect the species habitat with reserves and improve habitat values in other areas • Apply control programs for feral cats, Red Fox and pigs in Grey Snake habitat and allow Cane Toad resistant populations to recover (DCCEEW 2022) There is no conceivable reason the Project's activities would interfere with any of the management priorities identified above. The project's disturbance footprint with regard to potential habitat for the species is relatively minor and there is no evidence the species would occur. The Project will not interfere with the recovery of the species.
Assessment result	It is uncertain if the species actually occurs within the Study area or the region. The Project's extent of impact to low-value habitat comprising gilgais in cleared lands is minor given the extent of habitat present within the Study area. Based on the assessment above it is considered unlikely a significant impact to Grey Snake will occur as a result of the Project.

9.1.2.3 Australian Painted Snipe - Endangered

Ecology

Australian Painted Snipe is typically recorded singly or in small groups in freshwater marshes. They are extremely nomadic, moving in response to local rainfall and flooding. Although its occurrence in a location is often erratic, with the bird absent some years and common in others (Marchant & Higgins 1993) there is indication of some regular seasonal migration, e.g. to central and north coastal Queensland in autumn and winter (Black et al. 2010). Breeding only occurs in swamps with temporary water regimes and complex shorelines forming islands, shallow water, exposed wet mud and dense low fringing vegetation (Rogers et al. 2005; Geering et al. 2007). During non-breeding periods they may be found in a wider range of habitats including dams, rice paddocks, waterlogged grasslands, roadside drains and even brackish waterways (Marchant & Higgins 1993).

Association with Study area

The species was not recorded during surveys for the Project or for other projects in the local region (Golder 2018). EMM (2022) note the species had been observed in 2019 on the northern lease associated with the

Blackwater Mine (north-east of the Study area). There are two undated Birdlife Australia records of the species located 40 and 50 km east of the Study area (ALA 2023). The species may use farm dams in the Study area. Gilgais may provide ephemeral habitat for the species following heavy rains. It is noted most gilgai areas observed in the Study area were heavily vegetated and were generally unsuitable for the species presence as it requires open shallow, muddy areas for feeding.

DCCEEW approved species documents

The *Draft national recovery plan for the Australian Painted Snipe* (Australian Painted Snipe Recovery plan) (DEE 2020) has not been adopted under the EPBC Act but is considered in this assessment. No adopted threat abatement plan is considered relevant to the species. The Australian Painted Snipe Recovery plan identifies the following potentially threatening processes considered relevant to the species:

- Loss and degradation of wetland habitat including grazing and trampling by livestock and other introduced herbivores
- Diversion of water for irrigated agriculture
- Drainage and fragmentation of wetland habitat and reduced water quality
- Changes to plant cover in wetlands by invasive and native plant species
- Climate change
- Livestock overgrazing
- Predation by invasive species such as cats and Red Fox

Important populations are not relevant to the species as it is listed as endangered under the EPBC Act. The MNES Guidelines require consideration of impacts to populations. However, the species occurs as a single, homogenous breeding population and generally occurs in low numbers at a location (usually <10 individuals) (Garnett et al. 2011). The minimum extent of occurrence is estimated at 7,900,000 km^2 (Garnett & Baker 2021). As such, a population cannot be reliably attributed to the Study area.

Breeding habitat is thought to be quite specific and comprises shallow wetlands, with areas of exposed mud, and mixed heights of vegetative cover. Nests are almost always associated with small islands in freshwater wetlands (Rogers et al. 2005). Gilgai landforms comprising extensive systems of small mounds (1-3 m diameter) and hollows are also thought to be suitable (DEE 2020). Gilgais in the Study area occurred largely as scattered shallow depressions which were densely vegetated. A dense cover of the introduced Buffel Grass is dominant throughout. Breeding habitat is not considered to occur in the Study area.

Habitat considered critical to the survival of Australian Painted Snipe is considered in the Australian Painted Snipe Recovery plan to include:

- Habitat where the species is mapped as known or likely to occur especially where suitable breeding habitat occurs
- Locations outside the area identified above that may be periodically occupied when conditions are favourable

The Study area is located outside the species distribution mapped as known or likely to occur and suitable breeding habitat is not considered to occur. Given the paucity of records from the surrounding area and the habitat values observed as present there is no reason to believe habitat within the Study area would be considered as periodically occupied by the species Habitat considered critical to the survival of the species is not considered to be present.

Potential habitat for Australian Painted Snipe within the Study area encompasses permanent waterbodies (farm dams) and to a lesser extent ephemeral waterbodies associated with gilgais. The extent of gilgai habitat has been depicted in **Figure 10** there is potentially 1,513 ha of suitable habitat within the Study area. The Project will not impact any existing farm dams. The Project layout currently proposes to impact 0.89 ha in locations in the south-east of the Study area. This represents only 0.058% of the available gilgai habitat within the Study area. At this stage it is predicted that four production wells will be drilled each year thereby limiting the overall impact at any one time.

Table 22 provides an assessment of the potential for significant impacts on Australian Painted Snipe from the Project activities using the assessment criteria for vulnerable species outlined in the MNES Guidelines.

Table 22. Significant impact criteria assessment: Australian Painted Snipe

Criteria	Endangered species assessment
Lead to a long-term decrease in the size of a population of the species	The species is not known to occur within the Study area but may occur in the wider area. The species occurs as a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Study area. The species may occur on farm dams within the Study area. It's uncertain how suitable the gilgai habitat present is for the species given the dense cover observed across much of the Project area. The disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life of the Project. No farm dams will be impacted by Project activities. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction will necessarily take place in the dry season avoiding wet conditions that may be favourable to the species presence. Following well construction at a site any further disturbance will be negligible. Construction noise/vibration disturbance will be localised and temporary. Construction areas no longer required for operations will be revegetated (i.e. well sites only require 0.04 ha of cleared area for operational purposes). The Project is not considered likely to lead to a long term decrease in the size of a population of Australian Painted Snipe.
Reduce the area of occupancy a population	The species occurs a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Study area. The disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life of the Project. Habitat mapping indicates there is 1,513 ha of identical habitat within the overall Study area. It is predicted that four production wells will be drilled each year thereby limiting the overall extent of impact at any one time. Construction will necessarily take place in the dry season avoiding wet conditions that may be favourable to the species presence. Construction noise/vibration disturbance will be localised and temporary. The Project is not considered likely to reduce the occupancy of a population of Australian Painted Snipe.
Fragment an existing population into two or more populations	The species occurs a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Study area. The Project disturbance footprint occupies scattered locations within the Study area, much of which will be revegetated following construction completion. The species is highly mobile. The Project will not fragment an existing population of the species.
Adversely affect habitat critical to the survival of the species	There is no evidence habitat critical to the survival of the species is present. No farm dams will be impacted by the Project. The disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life of the Project. Habitat mapping indicates there is over 1,513 ha of identical habitat within the overall Study area. The Project is considered unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	The species occurs a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. A population will not be restricted to the Study area. Breeding habitat is not considered to be present. The project is not considered likely to disrupt the breeding cycle of a population of the species.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	The species is not known to occur within the Study area but may occur in the wider area. The species occurs as a single, sparsely distributed homogenous population across its range. If the species does occur it is only likely as transient individuals. No farm dams will be impacted by the Project. The disturbance footprint will impact a maximum area of 0.89 ha of marginally suitable gilgai habitat over the operational life of the Project. Habitat mapping indicates there is over 1,513 ha of identical habitat within the overall Study area. The Project disturbance footprint occupies scattered locations within the Study area, much of which will be revegetated following construction completion. The Project will not impact the availability or quality of habitat present to the extent the species would decline.

Criteria	Endangered species assessment
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat	Weed invasion is considered a potential threat to the species habitat. Buffel Grass occurs throughout suitable habitat areas for the species. Browsing and land degradation by cattle is considered a threat to the species habitat and is present in the Study area. Feral cat is also present and may be a predator on the species. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Project area or surrounds.
Introduce disease that may cause the species to decline	There are no identified introduced diseases or pathogens associated with this species. The Project activities do not require the importation of soils or other biological matters into the Project area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere with the recovery of the species	The Australian Painted Snipe Recovery plan identifies the following recovery objectives for Australian painted snipe: • Manage and protect known breeding habitats at the landscape scale • Develop methods to accurately observe changes in population trajectory and measure success of recovery activities • Reduce, or eliminate threats at breeding and non-breeding habitats • Improve knowledge of the habitat requirements, biology and behaviour of Australian Painted Snipe • Engage community stakeholders to improve awareness of the conservation of Australian Painted Snipe • Coordinate, review and report on the recovery process (DEE 2020) There is no conceivable reason the Project's activities would interfere with any of the recovery objectives identified above. The project's disturbance footprint with regard to potential habitat for the species is relatively minor and there is no evidence the species would occur. The Project will not interfere with the recovery of the species.
Assessment result	It is uncertain if the species actually occurs within the Study area. Suitable habitat for breeding is unlikely to occur. The Project's extent of impact to potential habitat comprising gilgais is minor given the extent of habitat present within the Study area. Based on the assessment above it is considered unlikely a significant impact to Australian Painted Snipe will occur as a result of the Project.

9.1.2.4 Koala - Endangered

Ecology

Koalas have a distinct association with eucalypt woodland and forest habitats comprising suitable food trees, mainly of the following genus: Eucalyptus, Corymbia, Angophora and Melaleuca (Moore & Foley, 2000; Martin et al. 2008). They are not necessarily restricted to bushland areas and are known to occur and breed where suitable tree species occur within farmland and the urban environment (Dique et al. 2004). Similarly, movement is not confined to vegetated corridors, as they also move across cleared rural land and through suburbs (Martin et al. 2008). They may use a variety of trees, including many non-eucalypts, for feeding, shelter and breeding purposes (Dique et al. 2004; Martin et al. 2008).

They are known to have localised and variable preferences throughout their range, favouring some tree species over others (Pahl & Hume 1990). At the local level they are known to prefer individual trees. It has been suggested this could be a response to a number of factors such as high leaf moisture and/or nitrogen content, and low levels of toxic chemical compounds which are expressed by eucalypts as a result of herbivory (Pahl & Hume 1990; Hume & Esson 1993; Moore & Foley 2000).

Breeding occurs in spring / summer when males become territorial. Young permanently leave the pouch after seven months but may continue to ride on the mothers back until approximately 12 months. After this time adolescent females may remain in the natal habitat. Males generally disperse to new territories from one to three years of age (Dique et al. 2003; Martin et al. 2008).

Association with Study area

No Koalas, or signs of presence (scats or tree scratches) have been recorded within or near the Study area during the Project surveys in 2022 or 2023. There are a large number of database records in the wider area including two records (1976 and 1996) located within the Study area itself (refer **Figure 8**). Most records are older (pre 1990). The nearest recent record is from 2012 and located 17 km south-east of the Study area. In recent surveys for other projects in the area Koalas were detected approximately 7 km west and south-west of the Study area in riparian and Acacia woodlands with emergent gums (EMM 2022). In addition, Koala scats were identified along Humboldt Creek approximately 22 km south of the Study area by Golder (2018).

In the region of the Project River Red Gum is a primary, or preferred, forage tree species of Koala. Dawson Gum is considered a secondary forage species (AKF 2015). This habitat occurs along Humboldt Creek and Comet River. Remnant eucalypt woodlands occur in scattered patches within the north of the Study area (mainly on Togara). The canopy of these habitat patches is generally dominated by Poplar Box. Poplar Box is also a forage tree species for Koala, although is less preferred. The only habitat featuring the preferred forage tree species from the region (River Red Gum and Dawson Gum) impacted by the Project area is narrow strips of riparian vegetation along Humboldt Creek and Comet River.

DCCEEW approved species documents

The *National recovery plan for the Koala Phascolarctos cinereus combined populations of Queensland, New South Wales and the Australian Capital Territory* (the Koala Recovery Plan) (DAWE 2022a) was approved on 8th April 2022. The Koala Recovery plan notes the following threats to the species:

- Habitat loss, fragmentation and modification including the impact of native forestry activities
- Drought, extreme heat events including associated with climate change
- Altered fire regimes
- Mortality from dog attack and vehicle collisions
- Diseases including Chlamydia and Koala retrovirus
- Plant pathogens impacting Koala habitat such as Myrtle Rust

The *Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory* (DAWE 2022b) notes (with relevance to Queensland) the priority management actions associated with the south-east Queensland population and that sub-populations on the western edge of the species range may be 'climate-sensitive' and comprise genes adapted to environmental extremes which may prove critical to populations elsewhere in the future through translocation programs.

The Koala Recovery plan does not specifically identify any areas comprising 'valued populations' of Koala but does note an imperative to conserve populations:

- That may act as source populations to adjacent areas
- Occur in areas of climatic refugia (specifically from droughts and heat waves)
- Genetically diverse
- Contain adaptive genes to potential environmental stressors or
- Are geographical or environmental outliers

Koalas have not been observed in or near the Project area either currently or recently. The woodlands associated with the area comprise widespread communities much of which is disturbed and located within a heavily cleared landscape. There is no reason to believe this habitat would serve as a climate refuge or that a population (should one occur) would be part of a valued population.

Similarly, the Koala Recovery plan does not provide a clear description of 'habitat critical to the survival' of Koala. It does note that in order to halt the decline and promote recovery of the species the following activities should be avoided:

- Clearing of habitat used by Koalas
- Reducing connectivity between patches used by Koala
- Clearing habitat used during extreme events
- Avoiding activities that will expose Koalas to additional threats

The Study area is largely heavily disturbed by past vegetation clearing and there is little evidence that Koala currently uses habitat within the Study area or surrounds to any substantive degree. The Project will not erect structures that will provide an impermeable barrier to movement across the landscape. The Project will not increase additional threats to the species in the area. The Project layout avoids impacting riparian eucalypt habitat which may be considered as a refuge during drought or extreme heat events. The species has not been observed in the Project area and there is no reason to believe the habitat present would be used during an extreme heat event, or there would be habitat critical to the survival of the Koala present within the Project area or the immediate surrounds.

There is 1,470 ha of Poplar Box dominated habitat (RE 11.5.3) within the Study area. The Project gas field infrastructure proposes to impact 1.17 ha of this habitat (i.e. 0.079% of the available habitat within the Study area). This impact occurs as linear patches scattered in the east of the layout. There will be extensive tracts of identical vegetation remaining in the adjacent landscape which will not be impacted by the Project. There is an additional 0.11 ha of riparian Queensland Blue Gum habitat within the Project footprint. Impacts on this vegetation will be minimised through the use of directional (underground) drilling for pipeline installation.

Table 23 provides an assessment of the potential for significant impacts on Koala from the Project activities using the assessment criteria for Endangered species outlined in the MNES Guidelines.

Table 23. Significant impact criteria assessment: Koala

Criteria	Endangered species assessment
Lead to a long-term decrease in the size of a population of the species	The species (including any signs of presence) was not recorded within the Project area or surrounds during surveys (including spotlighting) carried out in 2022 and 2023. There are older database records located within the Study area (ALA 2023) and recent records of Koala in the wider area from other studies (Golder 2019; EMM 2022). Preferred forage tree species in inland Queensland includes habitat supporting River Red Gum. The gas field layout does not proposes to clear such habitat. The Project will impact 1.17 ha of habitat comprising Poplar Box as the dominant canopy species. Poplar Box is less preferred for foraging in the region although Koala is known to feed on the species. There is abundant similar habitat in the surrounding area and region that will remain undisturbed. The majority of the Study area that will be impacted comprises cleared habitat sometimes with scattered regrowth Brigalow (which is not a forage tree for Koala). A fauna spotter is recommended to be present during vegetation clearing within suitable habitat for Koala to eliminate any potential impact on Koala individuals (should any be present at the time). Indirect impacts to Koala habitat from Project activities (such as noise, lighting and dust settlement) will be temporary and have a very minor impact at worst. The project is considered highly unlikely to lead to a long-term decrease in the size of a population of Koala.
Reduce the area of occupancy a population	The species is not known from the local area associated with the Project but may occur. There is no evidence the remnant vegetation associated with the Study area would support all or part of a local population of Koala. The Study area is largely cleared of remnant vegetation which may support the species. The Project proposes to clear 1.28 ha of potential habitat for Koala. This area is spread across scattered patches within the overall layout. There is abundant identical habitat located adjacent to the Project infrastructure which will remain undisturbed. Cleared habitat within the disturbance area largely comprises sparse regrowth Brigalow which does not comprise forage habitat for Koala. The project is considered highly unlikely to reduce the area of occupancy of a population of Koala.
Fragment an existing population into two or more populations	There is no evidence the minor area of remnant vegetation associated with the gas field layout would support all or part of a local population of Koala. The Study area is largely cleared of remnant vegetation which may support the species. The Project does not require elements that will represent a barrier to the species movement across the Study area and surrounds. The Project will not fragment an existing population of Koala.

Criteria	Endangered species assessment
Adversely affect habitat critical to the survival of the species	There is no evidence habitat critical to the survival of the species is present. The gas field layout does not propose to clear riparian habitat which may be used as a refuge during drought conditions. The disturbance footprint will impact a maximum area of 1.28 ha of potentially suitable habitat over the operational life of the Project. Habitat mapping indicates there is over 1,353 ha of identical habitat within the overall Study area. The Project is considered unlikely to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of a population	There is no evidence the small area of remnant vegetation associated with the Project area would support all or even part of a local population of Koala. It is considered unlikely the Project will disrupt the breeding cycle of an important population of Koala.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	It Is not known if the species occurs within the Project area, although suitable habitat occurs. The Project proposes to clear 1.28 ha of potential habitat for Koala. This area is spread across scattered patches within the overall layout. There is abundant identical habitat located adjacent to Project infrastructure which will remain undisturbed. The Project impacts largely occur in unsuitable grasslands, much of which will be reinstated following completion of construction. The Project will not impact the availability or quality of habitat to the extent that the species is likely to decline.
Result in invasive species that are harmful to an endangered species becoming established in the endangered species habitat	Weed invasion is not considered a threat to the species. Feral and domestic dogs are a known threat to the species and are likely present to some degree in the landscape. Dingo was observed onsite in 2022. A weed and pest management plan will be developed and implemented, including the construction and operational phases of the Project. The Project will not result in the introduction of a novel invasive species, or proliferation of an existing invasive species in the Project area or surrounds.
Introduce disease that may cause the species to decline	Myrtle rust may impact a range of eucalypt species and may be a potential threat to habitat for Koala (DAWE 2022a). The Project activities do not require the importation of soils or other biological matters into the Project area. Machinery imported from outside the region for Project earthworks, transportation and other construction activities will be required to be certified free of weed seeds and soil matter prior to entry onsite. It is inconceivable the Project activities will result in the introduction of a disease causing the species to decline.
Interfere with the recovery of the species	The Koala Recovery plan outlines a number of recovery strategies and actions for the species including the following: • Identify nationally important populations and strategic areas for restoration, climate/fire refugia and movement corridors • Coordinate research programs including implementing a national monitoring program • Increase the area of protected Koala habitat through incorporation into State protected areas and on private lands and improve land management practises • Ensure koala conservation is integrated into policy, and statutory and land-use plans • Develop and implement strategic restoration of habitat including through natural resource management and land care groups and develop revegetation and restoration guidelines • Develop a strategy of active management practices Koala metapopulations including monitoring population health, fire management, and guidelines for managing Koala translocations and post-care release of individuals (DAWE 2022a) It is uncertain to what extent the species actually occurs in the local area. The majority of the Study area has been heavily impacted by previous grazing practices. Should the species occur within or near Project works any impact will be very minor and is considered unlikely to interfere substantially with the management actions identified above or the recovery of the species.
Assessment result	It is uncertain to what extent the species actually occurs within the Study area. The Project's extent of impact to potential foraging habitat comprising is very minor given the extent of habitat present elsewhere within the Study area. Based on the assessment above it is considered unlikely a significant impact to Koala will occur as a result of the Project.

9.2 Significant Residual Impacts - Environmental Offsets

Based on the SRI assessments for MNES detailed in the previous sections associated with the potential impacts of the Project, there are no predicted impacts to environmental values potentially requiring environmental offsets.

10 CONCLUSION

Comet Ridge Mahalo North Pty Ltd (Comet Ridge) is proposing to develop a greenfield Coal Seam Gas (CSG) project contained within ATP2048 (the Project). The Project area is situated in Central Queensland approximately 45 kilometres (km) north of Rolleston and lies within the Central Highlands Regional Council area. The Project will require the development of 68 coal seam gas wells, gas gathering pipelines, a gas compression facility (GCF), and new access tracks. At this stage of the Project the location of the export pipeline alignment is still under investigation. Therefore, the export pipeline is excluded from this assessment.

The Project is located within the Brigalow Belt North Bioregion (BBNB). Within the BBNB the Project area lies within the Isaac-Comet Downs subregions. The overall Study area (which represents 45 subblocks within ATP2048) covers 14,084 hectares (ha), of which the majority (over 85 percent) (%) has been cleared for cattle grazing and cropping. Remnant vegetation is located largely in the northern section of the Study area on Togara property. Topography is relatively flat undulating downs, descending from the higher alluvial areas on the eastern boundary to the alluvial flats associated with the Comet River. The Project is located within the Comet River catchment which is part of the Fitzroy River Basin.

Desktop review and field surveys (carried out in 2022, 2023 and 2024) were carried out to characterise the terrestrial ecological values associated with the Project and immediate surrounds. The desktop review identified the potential presence of eight flora species and 30 fauna species listed as threatened under the *Nature Conservation Act 1992* (NC Act) and/or *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) as potentially occurring within the Study area and surrounds. A further 12 species listed as Migratory (under the EPBC Act) and Special Least Concern (SLC) (under the NC Act) were also predicted to occur. Other environmental values predicted to be present and listed as MSES include endangered regulated vegetation (under the *Vegetation Management Act 1999* (VM Act)) and protected wildlife habitat.

The flora survey identified 13 Regional Ecosystems (REs) within the Study area based on site surveys and analysis of aerial imagery. There are six REs comprising Brigalow communities listed as Endangered under the Queensland *Environmental Protection Act 1994* (EP Act) present. The majority of vegetation is listed as No Concern under the EP Act. There are substantial differences with the current State Government RE mapping which overstates the potential extent of Brigalow communities present within the Study area. The EPBC Act listed Brigalow TEC is considered present as scattered patches throughout the Study area. A single small patch of SEVT TEC occurs in the south-east corner of the Study area. No threatened flora species listed under the EPBC Act have been recorded during Project surveys, or other surveys carried out within the Study area. Nevertheless, one species is considered likely to be present: Annual Wiregrass (*Aristida annua*) (Vulnerable - EPBC Act and NC Act). One other threatened flora species has some potential to occur.

State mapping for threatened fauna species indicates there is habitat for Ornamental Snake (*Denisonia maculata*) (Vulnerable – EPBC Act and NC Act) within the Study area. No threatened or migratory species were recorded during site surveys for the Project. Short-beaked echidna (*Tachyglossus aculeatus*) is listed as SLC under the NC Act and was recorded during the Project surveys. Ornamental Snake has been recorded to the east and south-east of the Study area and is considered likely to occur based on the presence of suitable gilgai habitat, although targeted trapping during ideal conditions did not record the species. Koala (*Phascolarctos cinereus*) is also considered likely to occur based on older database records located within the Study area and the presence of suitable habitat. The Project area provides possible habitat for a further six threatened species and four migratory bird species.

In general, impacts resulting from Project activities will be minor and likely restricted to the construction phase. The location of Project infrastructure has been substantially revised and located away from sensitive ecological values as much as is feasible. The current Project layout of gas field infrastructure requires disturbance (vegetation clearing) of a maximum of 178.27 ha the majority of which is located in lands cleared for cattle grazing. The Project disturbance footprint has been refined to minimise impact on ecological values and is predicted to impact only 1.17 ha of remnant Poplar Box woodland (No concern under the EP Act) and 0.11 ha of remnant Queensland Blue Gum open forest (Of concern under the EP Act) through vegetation clearing. Impacts on the Queensland Blue Gum habitat will be minimised through the application of directional drilling for pipeline installation. The Project will also impact 0.89 ha of cleared habitat comprising gilgais which may provide potential habitat for threatened species (Ornamental Snake in particular). The majority of the

clearing impact will be restricted to narrow linear areas associated with the gathering flow line construction disturbance and clearing for well pads. Any potential indirect impacts to adjacent fauna/flora habitat from the Project are expected to be minimised through a range of mitigation measures applied under the project Construction Environmental Management Plan (CEMP) and Operational environmental Management Plan (OEMP).

The Project's impacts to Environmental Values were subject to a risk assessment analysis and assessment for significant impacts under State and Commonwealth guidelines. The Project was assessed as avoiding the potential to cause significant residual impacts (SRI) to any Matters of National Environmental Significance (MNES) or Matters of State Environmental Significance (MSES) identified as potentially occurring in the Study area.

11 ACRONYMS AND GLOSSARY

AHD	Australian Height Datum
ALA	Atlas of Living Australia
ANZECC	Australian and New Zealand Environment and Conservation Council
ATP2048	Authority to Prospect 2048
BBNB	Brigalow Belt North Bioregion
Biosecurity Act	*Biosecurity Act 2014*
Bonn Convention	Convention on the Conservation of Migratory Species of Wild Animals
CAMBA	China-Australia Migratory Bird Agreement
CEMP	Construction Environmental Management Plan
Coal seam gas	CSG
Comet Ridge	Comet Ridge Mahalo North Pty Ltd
DAF	Department of Agriculture and Fisheries
DCCEEW	Commonwealth Department of Climate Change, Energy, Environment and Water
DES	Department of Environment and Science
DoR	Department of Resources
EA	Environmental Authority
EDL	Ecologically dominant layer
EOO	Extent of occurrence
EOP	*Environmental Offsets Policy October 2012* (Commonwealth)
End Of Waste Code	End Of Waste Code
EP Act	*Environmental Protection Act 1994*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ERAs	Environmentally Relevant Activities
ESA	Environmentally Sensitive Areas
ESCP	Erosion and Sediment Control Plan
Fisheries Act	*Fisheries Act 1994*
GBO	General biosecurity obligation
GCF	Gas compression facility
Ha	hectares
HES	high ecological significance
JAMBA	Japan-Australia Migratory Bird Agreement
Koala Recovery Plan	*National recovery plan for the Koala* Phascolarctos cinereus *combined populations of Queensland, New South Wales and the Australian Capital Territory*
km	Kilometres
L	Litres
m	metres
mm	millimetres
ML	Megalitres
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NC Act	*Nature Conservation Act 1992*
NSW	New South Wales
OEMP	Operation Environmental Management Plan
Offsets Act	*Environmental Offsets Act 2014*
Offsets Regulation	*Environmental Offsets Regulation 2014*
PMR	Protected Matters Report
PMST	Protected Matters Search Tool
ROKAMBA	Republic of Korea-Australia Migratory Bird Agreement
PEM	Prescribed Environmental Matters

PPL	Petroleum Pipeline Lease
QEOP Guideline	Queensland Environmental Offsets Policy Significant Residual Impact Guideline
QFES	Queensland Fire and Emergency Services
RE	Regional Ecosystems
Australian Painted Snipe Recovery plan	*Draft national recovery plan for the Australian Painted Snipe*
Referral guidelines	*Draft referral guidelines for the nationally listed Brigalow Belt reptiles*
SIS	Surface to in-seam
SPP	State Planning Policy
SRI	Significant residual impact
TEC	Threatened Ecological Communities
the Project	A greenfield coal seam gas plant and well infrastructure contained within Authority to Prospect 2048
the Study area	Project gas field area confined to ATP2048 (14,078 ha), which represents 45 sub-blocks
WildNet	Queensland Government Wildlife Online
WoNS	Weeds of National Significance

12 REFERENCES

Atlas of Living Australia (ALA) 2023, Atlas of Living Australia spatial portal. Accessed at: https://spatial.ala.org.au/.

Augee, ML 2008, 'Short-beaked Echidna Tachyglossus aculeatus', in S Van Dyck & R Strahan (eds), The mammals of Australia, Third edition, Reed New Holland, Sydney, pp. 37-39.

Australian Biological Resources Study (ABRS) 2023, Australian Faunal Directory. Australian Biological Resources Study, Canberra. Accessed at: https://biodiversity.org.au/afd/home.

Australian Koala Foundation (AKF) 2015, National Koala tree planting list. Report prepared for the Australian Koala Foundation.

Baker, A & Dickman, C 2018, Secret lives of carnivorous marsupials, CSIRO Publishing, Clayton South.

Black, R, Houston, W & Jaensch, R 2010, 'Evidence of regular seasonal migration by Australian painted snipe Rostratula australis to the Queensland tropics in autumn and winter', Stilt, vol. 58, pp. 1-9.

Blakers, M, Davies, SJJF & Reilly, PN 1984, The atlas of Australian birds, Melbourne University Press, Melbourne.

Boles, WE 1988, The robins & flycatchers of Australia: the National Photographic Index of Australian Wildlife, Angus & Robertson Publishers, Sydney.

Brigalow Belt Reptiles Workshop 2010, Proceedings from the workshop for the nine listed reptiles of the Brigalow Belt bioregions, 18-19 August 2010, Queensland Herbarium, Brisbane.

BTFRT 2007, National recovery plan for the black-throated finch southern subspecies Poephila cincta cincta. Black-throated Finch Recovery Team, Department of Environment and Climate Change (NSW) and Queensland Parks and Wildlife Service, Report to the Department of the Environment and Water Resources, Canberra. Department of Environment and Climate Change (NSW), Hurstville and Queensland Parks and Wildlife Service, Brisbane. Available from: http://www.environment.gov.au/biodiversity/threatened/recovery-plans/national-recovery-plan-black-throated-finch-southern-subspecies-poephila-cincta-cincta.

Buchanan B. W. 1993, Effects of enhanced lighting on the behaviour of nocturnal frogs. Animal Behaviour, Vol 45, pp. 893–899.

BoM 2023, Climate data online. Bureau of Meteorology, Bureau of Meteorology, Commonwealth of Australia. Canberra. Available from: http://www.bom.gov.au/climate/averages/tables/cw_035129.shtml

Burnett, S 2012, 'Northern Quoll Dasyurus hallucatus Gould, 1842', in LK Curtis, AJ Dennis, KR McDonald, PM Kyne & SJS Debus (eds), Queensland's threatened animals, CSIRO Publishing, Collingwood, pp. 340-341.

Chaston, K & Doley, D 2006, 'Mineral Particulates and Vegetation: Effects of Coal Dust, Overburden and Flyash on Light Interception and Leaf Temperature, Clean Air and Environmental Quality, vol. 40, pp. 40-44.

CHRC 2019, Central Highlands Regional Council Biosecurity Plan 2020-2025, Central Highlands Regional Council, Queensland, AustraliaDES 2022a, Species profile—Cerbera dumicola. Department of Environment and Science, Queensland Government. Available at: https://apps.des.qld.gov.au/species-search/details/?id=8936

Covacevich, J & Wilson, S 1995, 'Land Snakes', in M Ryan (ed), Wildlife of Greater Brisbane, Queensland Museum, Brisbane, pp 275-295.

Crome, F & Shields, J 1992, The parrots and pigeons of Australia: the National Photographic Index of Australian wildlife, Angus and Robertson, Pymble.

DAF 2018, Accepted development requirements for operational work that is constructing or raising waterway barrier works, Department of Agriculture and Fisheries, https://www.daf.qld.gov.au/__data/assets/pdf_file/0006/1476888/adr-operational-waterway-barrier-works.pdf.

DAWE 2022a, National Recovery Plan for the Koala Phascolarctos cinereus (combined populations of Queensland, New South Wales and the Australian Capital Territory). Department of Agriculture, Water and the Environment, Australian Government, Canberra. Available at: http://www.awe.gov.au/environment/biodiversity/threatened/publications/recovery/koala-2022.

DAWE 2022b, Conservation Advice for Phascolarctos cinereus (Koala) combined populations of Queensland, New South Wales and the Australian Capital Territory, Department of Agriculture, Water and the Environment, Australian Government, Canberra. Available online: http://www.environment.gov.au/biodiversity/threatened/species/pubs/85104-conservation-advice-12022022.pdf

DCCEEW 2022, Conservation Advice for Hemiaspis damelii (grey snake). Department of Climate Change, Energy, the Environment and Water, Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1179-conservation-advice-05102022.pdf.

DCCEEW 2024, Species Profile and Threats Database. Department of Climate Change, Energy, Environment and Water, Australian Government, Canberra. Available at: https://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=17906.

DE 2013a, Matters of National Significance significant impact guidelines 1.1. Department of the Environment, Australian Government, Canberra. Available at: https://www.agriculture.gov.au/sites/default/files/documents/nes-guidelines_1.pdf

DE 2013b, Approved Conservation Advice for the Brigalow (*Acacia harpophylla* dominant and co-dominant) ecological community. Department of the Environment, Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/communities/pubs/028-conservation-advice.pdf.

DE 2014a, Approved Conservation Advice for Aristida annua (a tufted grass). Department of the Environment, Australian Government, Canberra. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/17906-conservation-advice.pdf.

DE 2014b, Approved Conservation Advice for Denisonia maculata (Ornamental Snake). Canberra: Department of the Environment, Australian Government, Canberra. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/1193-conservation-advice.pdf.

DE 2015, Conservation Advice Grantiella picta painted honeyeater, Department of the Environment, , Australian Government, Canberra. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/470-conservation-advice.pdf.

DE 2020a, Rheodytes leukops in Species Profile and Threats Database, Department of the Environment, Canberra, available from: http://www.environment.gov.au/sprat. Accessed 20/02/2023.

DEE 2020, Draft National recovery plan for the Australian Painted Snipe, Department of the Environment and Energy, Australian Government, Canberra, Available at: https://www.dcceew.gov.au/sites/default/files/env/consultations/5e6b3fbf-ef4d-4d0a-b9c8-c8e29bb11afc/files/draft-recovery-plan-australian-painted-snipe.pdf

DEHP 2014, Queensland Environmental Offsets Policy - significant residual impact guideline, Department of Environment and Heritage Protection, Queensland Government, Brisbane.

DES 2020, Flora Survey Guidelines – Protected Plants. Department of Environment and Science, Queensland Government, Brisbane.

DES 2023a, Species profile—Cerbera dumicola. Department of Environment and Science, Queensland Government, Brisbane. Available at: https://apps.des.qld.gov.au/species-search/details/?id=8936

DES 2022b, Species profile—Dichanthium queenslandicum. Department of Environment and Science, Queensland Government, Brisbane. Available at: https://apps.des.qld.gov.au/species-search/details/?id=11064.

DES 2022c, Species profile – Solanum dissectum. Department of Environment and Science, Queensland Government, Brisbane. Available at: https://apps.des.qld.gov.au/species-search/details/?id=6198.

DES 2022d, Species profile – Solanum elachophyllum. Department of Environment and Science, Queensland Government, Brisbane. Available at: https://apps.des.qld.gov.au/species-search/details/?id=13541#:~:text=Solanum%20elachophyllum%20is%20endemic%20to,%3B%20Queensland%20Herbarium%2C%202012).

DEWHA 2008a. Approved Conservation Advice for Marsdenia brevifolia. Department of the Environment, Water, Heritage and the Arts, Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/64585-conservation-advice.pdf. In effect under the EPBC Act from 16-Dec-2008.

DEWHA 2008b, Approved Conservation Advice for Cadellia pentastylis (Ooline). Canberra: Department of the Environment, Water, Heritage and the Arts, Australian Government, Canberra. Available from: http://www.environment.gov.au/biodiversity/threatened/species/pubs/9828-conservation-advice.pdf. In effect under the EPBC Act from 01-Oct-2008.

DEWHA 2008c, Approved Conservation Advice for Dichanthium setosum. Canberra: Department of the Environment, Water, Heritage and the Arts, Australian Government, Canberra. 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

Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) 2011a, Draft Referral guidelines for the nationally listed Brigalow Belt reptiles. Department of Sustainability, Environment, Water, Populations and Communities. Australian Government, Canberra.

DSEWPC 2011, Threat abatement plan for the biological effects, including lethal toxic ingestion, caused by cane toads. Department of Sustainability, Environment, Water, Populations and Communities. Australian Government, Canberra. Available at: http://www.environment.gov.au/resource/threat-abatement-plan-biological-effects-including-lethal-toxic-ingestion-caused-cane-toads

Dique, DS, Thompson, J, Preece, HJ, de Villiers, DL & Carrick, FN 2003, 'Dispersal patterns in a regional koala population in south-east Queensland.' Wildlife Research, vol. 30, pp. 281-290.

Dique, DS, Preece, HJ, Thompson, J & de Villiers, DL 2004, 'Determining the distribution and abundance of a regional koala population in south-east Queensland for conservation management', Wildlife Research, vol. 31, pp. 109-117.

Eddie, C 2012, 'Yakka Skink Egernia rugosa De Vis, 1888', in LK Curtis, AJ Dennis, KR McDonald, PM Kyne & SJS Debus (eds), Queensland's threatened animals, CSIRO Publishing, Collingwood, pp. 224-225.

Ehmann, H 1992, Encyclopedia of Australian animals: reptiles, Angus & Robertson, Sydney.

EMM 2022, Blackwater terrestrial ecology survey report, flora and fauna seasonal surveys - Blackwater South Report prepared for BHP BMA (February 2022).

ERM 2017, Spring Gully North-West and North East – Drilling Mud and Cement Additive Chemical Risk Assessment. Prepared for Origin Energy. November 2017.

Eyre, TJ 2006, 'Regional habitat selection of large gliding possums in southern Queensland, Australia: 1. Greater Glider (Petauroides volans)', Forest Ecology and Management, vol. 235, pp. 270-282.

Eyre, T.J., Kelly, A.L, Neldner, V.J., Wilson, B.A., Ferguson, D.J., Laidlaw, M.J. and Franks, A.J. 2015, *BioCondition: A Condition Assessment Framework for Terrestrial Biodiversity in Queensland. Assessment Manual. Version 2.2*. Queensland Herbarium, Department of Science, Information Technology, Innovation and Arts, Brisbane.

Eyre, T, Ferguson D, Smith G, Mathieson M, Venz, M, Hogan, L, Hourigan C, Kelly, A & Rowland, J 2022, Terrestrial Vertebrate Fauna Survey Assessment Guidelines for Queensland, Version 4.0. Department of Environment and Science, Queensland Government, Brisbane. Accessed at: https://www.qld.gov.au/__data/assets/pdf_file/0022/68224/fauna-survey-guidelines.pdf

Eyre, TJ, Smith, GC, Venz, MF, Mathieson, MT, Hogan, LD, Starr, C, Winter, J & McDonald, K 2022, Guide to greater glider habitat in Queensland, report prepared for the Department of Agriculture, Water and the Environment, Canberra. Department of Environment and Science, Queensland Government, Brisbane.

Farmer, AM, 1993, The effects of dust on vegetation – a review, Environmental Pollution, vo. 79, pp. 63-75.

Field, JP, Belnap, J, Breshears, DD, Neff, JC, Okin, GS, Whicker, JJ, Painter, TH, Ravi, S, Reheis, MC & Reynolds, RL 2010, 'The ecology of dust', Frontiers in Ecology and the Environment, vol. 8, pp. 423-430.

Frith, HJ 1982, Pigeons and doves of Australia, Rigby, Adelaide.

Garnet, ST & Baker, GB 2021, The action plan for Australian birds 2020, CSIRO Publishing, Collingwood.

Garnett, ST, Szabo, JK & Dutson, G 2011, The action plan for Australian birds 2010, CSIRO Publishing, Collingwood.

Geering, A, Agnew, L & Harding, S 2007, Shorebirds of Australia, CSIRO Publishing, Collingwood.

Golder 2018, Mahalo Gas Project: ecology technical report. Report prepared for Comet Ridge Limited (August 2018).

Gordos, M 2012, 'Fitzroy River Turtle Rheodytes leukops Legler & Cann, 1980', in LK Curtis, AJ Dennis, KR McDonald, PM Kyne & SJS Debus (eds), Queensland's threatened animals, CSIRO Publishing, Collingwood, pp. 205-206.

Hamann, M, Schäuble, CS, Limpus, DJ, Emerick, SP & Limpus, CJ 2007, Management plan for the conservation of Elseya sp. [Burnett River] in the Burnett River Catchment, Environmental Protection Agency, Brisbane.

Higgins, PJ & Davies, SJJF (eds) 1996, Handbook of Australian, New Zealand and Antarctic birds, Vol. 3: snipe to pigeons, Oxford University Press, Melbourne.

Higgins, PJ (ed) 1999, Handbook of Australian, New Zealand and Antarctic birds, Vol 4: parrots to dollarbird, Oxford University Press, Melbourne.

Higgins, PJ, Peter, JM & Cowling, SJ (eds) 2006, Handbook of Australian, New Zealand and Antarctic birds, Vol. 7: boatbill to starlings, Part A: boatbill to larks, Oxford University Press, South Melbourne.

Hobson, R 2012. Grey snake, Hemiaspis damelii. In 'Queensland's Threatened Animals' (Eds L. K. Curtis, A. J. Dennis, K. R. McDonald, P. M. Kyne and S. J. S. Debus) pp. 245-246. CSIRO Publishing: Collingwood.

Hume, ID & Esson, C 1993, 'Nutrients, antinutrients and leaf selection by captive koalas (Phascolarctos cinereus).' Australian Journal of Zoology, vol. 41, pp. 379–392.

Johnson, RW, McDonald, WJ, Fensham, RJ, McAlpine, CA & Lawes, MJ 2016, 'Changes over 46 years in plant community structure in a cleared brigalow (*Acacia harpophylla*) forest, *Austral Ecology*, vol. 41, pp. 644-656.

KCB 2018, Project Atlas EPBC Referral – Water Report Final. Prepared for Senex Energy Ltd.

Kehl, J & Borsboom, A 1984, 'Home range, den tree use and activity patterns in the greater glider, Petauroides volans', in AP Smith & ID Hume (eds), Possums and gliders, Australian Mammal Society, Sydney, pp. 229-236.

Marchant, S & Higgins, PJ (eds) 1990, Handbook of Australian, New Zealand and Antarctic birds, Vol. 1: ratites to ducks, Part B, Australian pelican to ducks, Oxford University Press, Melbourne.

Marchant, S & Higgins, PJ (eds) 1993, Handbook of Australian, New Zealand and Antarctic birds. Vol. 2: raptors to lapwings, Oxford University Press, Melbourne.

Martin, RW, Handasyde, KA & Krockenberger, A 2008, 'Koala Phascolarctos cinereus', in S Van Dyck & R Strahan (eds), The mammals of Australia, Third edition, Reed New Holland, Sydney, pp. 198-201.

Matheu, E & del Hoyo, J 1992, 'Family Threskiornithidae (Ibises and Spoonbills)', in J del Hoyo, A Elliott & J Sargatal (eds), Handbook of the birds of the world, Vol. 5: ostrich to ducks, Lynx Edicions, Barcelona, pp. 472-506.

Melzer, A 2012, 'Ornamental Snake Denisonia maculata (Steindachner, 1867)', in LK Curtis, AJ Dennis, KR McDonald, PM Kyne & SJS Debus (eds), Queensland's threatened animals, CSIRO Publishing, Collingwood, pp. 241-242.

Menkhorst, P 2010, A field guide to the mammals of Australia, Third Edition, Oxford University Press, South Melbourne.

Menkhorst, P, Rogers, D & Clarke, R 2017, The Australian bird guide, CSIRO Publishing, Clayton South.

Moore, BD & Foley, WJ 2000, 'A review of feeding and diet selection in koalas (Phascolarctos cinereus)', Australian Journal of Zoology, vol. 48, pp. 317-333.

Neldner, VJ, Wilson, BA, Thompson, EJ, Dillewaard, HA, Ryan TS, Butler DW, McDonald WJF, Richter D, Addicott EP & Appelman CN 2022. Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland, Version 6.0. Queensland Herbarium, Queensland Environmental Protection Agency, Brisbane.

Oakwood, M 2008, 'Northern Quoll Dasyurus hallucatus,' in S Van Dyck & R Strahan (eds), The mammals of Australia, Third edition, Reed New Holland, Sydney, pp. 57-59.

Pahl, LI & Hume, ID 1990, 'Preferences for Eucalyptus species of the New England Tablelands and initial development of an artificial diet for Koalas.' In: AK Lee, KA Handasyde and GD Sanson (eds.), Biology of the Koala. Surrey Beatty and Sons, Sydney. pp. 123–128.

Peck, S 2012, 'Collared Delma Delma torquata Kluge, 1974', in LK Curtis, AJ Dennis, KR McDonald, PM Kyne & SJS Debus (eds), Queensland's threatened animals, CSIRO Publishing, Collingwood, pp. 218-219.

Pennay, M, Ellis, M & Parnaby, H 2011, 'The bat fauna of New South Wales and the Australian Capital Territory.' In: B. Law, P. Eby, D. Lunney & L. Lunsdem (eds.) The biology and conservation of Australian bats, Royal Zoological Society of New South Wales, Sydney.

Perry, G, Buchanan, BW, Fisher, RN, Salmon, M & Wise, SE 2008, 'Effects of artificial night lighting on amphibians and reptiles in urban environments.' In: JC Mitchell, RE Jung Brown & B Bartholomew (eds.), Herpetological Conservation, Society for the Study of Amphibians and Reptiles.

Pizzey, G 1980, A field guide to the birds of Australia, Collins, Sydney.

Pringle, JD 1985, The waterbirds of Australia: the National Photographic Index of Australian wildlife, Angus and Robertson, North Ryde.

QGlobe 2023, Queensland Globe, State of Queensland. Accessed at: https://qldglobe.information.qld.gov.au/

Queensland Herbarium 2012, Specimen label information. Queensland Herbarium, Department of Environment and Science, Queensland Government, Brisbane.

Queensland Herbarium 2021a, Introduction to the Census of the Queensland flora 2021. Queensland Herbarium, Department of Environment and Science.

Queensland Herbarium 2021b, Regional Ecosystem Description Database (REDD). Version 12.1, Department of Science, Brisbane.

Radle, AL 2007, Effects of noise on wildlife: a literature review, Available at: http://wfae.proscenia.net/library/articles

Rich, C & Longcore, (eds.) T 2006, Ecological consequences of artificial night lighting, Island Press, Washington.

Richardson, R 2008, Queensland Brigalow Belt reptile recovery plan 2008 – 2012, Report to the Department of the Environment, Water, Heritage and the Arts, Canberra, WWF-Australia, Brisbane.

Rogers, D, Hance, I, Paton, S, Tzaros, C, Griffioen, P, Herring, M, Jaensch, R, Oring, L, Silcocks, A & Weston, M 2005, 'The breeding bottleneck: breeding habitat and population decline in the Australian painted

snipe', in P Straw, (ed), Status and conservation of seabirds in the East Asian-Australasian Flyway: proceedings of the Australasian Shorebirds Conference, 13-15 Dec 2003, Canberra, Wetlands International Global Series 18, International Wader Studies 17, Sydney, pp. 15-23.

Schoenjahn, J 2018, Adaptations of the rare endemic Grey Falcon Falco hypoleucos that enable its permanent residence in the arid zone of Australia. PhD Thesis. University of Queensland.

Simon, B 1992, A revision of the genus Aristida (Poaceae) in Australia. Austrobaileya, vol. 2, pp. 87-102.

Specht & Specht 2000, Australian Plant Communities, Oxford University Press, USA.

Sprent, J & Nicol, S 2012, The influence of habitat on home range size of the short beaked echidna, Australian Journal of Zoology, vol. 60, pp. 46-53.

Squatter Pigeon Workshop 2011, Proceedings from the workshop for the Squatter Pigeon (southern), 14-15 December 2011, Queensland Parks and Wildlife Service, Toowoomba.

Swan, G & Wilson, S 2012, 'The results of fauna recovery from a gas pipeline trench, and a comparison with previously published reports', Australian Zoologist, vol. 36, pp. 129-136.

Threatened Species Scientific Committee (TSSC) 2016, Conservation Advice Bertya opponens. Threatened Species Scientific Committee, Department of the Environment and Energy, Australian Government, Canberra.. Available at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/13792-conservation-advice-16122016.pdf.

TSSC 2020, Conservation Advice Falco hypoleucos Grey Falcon. Department of Agriculture, Water and the Environment, Queensland Government, Canberra. Accessed at: http://www.environment.gov.au/biodiversity/threatened/species/pubs/929-conservation-advice-09072020.pdf.

Threlfall, CG, Law, B, & Banks, PB 2013, 'The urban matrix and artificial light restricts the nightly ranging behaviour of Gould's long-eared bat (Nyctophilus gouldi).' Austral Ecology, vol. 38, pp. 921–930.

Tucker, AD, Limpus, CJ, Priest, TE, Cay, J, Glen, C & Guarino, E 2001, 'Home ranges of Fitzroy River turtles (Rheodytes leukops) overlap riffle zones: potential concerns related to river regulation', Biological Conservation, vol. 102, pp. 171-181.

Turbill, C & Ellis, M 2006 'Distribution and abundance of the south eastern form of the greater long-eared bat Nyctophilus timoriensis', Australian Mammalogy, vol. 28, pp. 1-7.

Turbill, C, Lumsden, LF & Ford, GI 2008, 'South-eastern & Tasmanian long-eared bats Nyctophilus spp', in S Van Dyck & R Strahan (eds), The mammals of Australia, Third edition, Reed New Holland, Sydney, pp. 527-528.

WaterMark EcoHydrology 2024, *Groundwater Dependent Ecosystem Assessment – Mahalo North CSG Development*, dated 15 November 2024

Wilson, S & Swan, G 2017, A complete guide to reptiles of Australia, Third edition, New Holland Publishers, Sydney.

Wilson, S 2015, A field guide to reptiles of Queensland, Second edition, Reed New Holland, Sydney.

Woinarski, JCZ, Burbidge, AA & Harrison, PL 2014, The action plan for Australian mammals 2012, CSIRO Publishing, Collingwood.

13 LIMITATIONS

Epic Environmental Pty Ltd (Epic) has prepared the following report for the exclusive benefit of Comet Ridge Mahalo North Pty Ltd (Client) and for the singular purpose of providing an ecological assessment and Ecological Assessment Report of the proposed Mahalo North Development Area. All interpretations, finding or recommendations outlined in this report should be read and relied upon only in the context of the report as a whole.

The following report cannot be relied upon for any other purpose, at any other location or for the benefit of any other person, without the prior written consent of Epic. Except with Epic's prior written consent, this report may not be:

a. released to any other person, whether in whole or in part;
b. used or relied upon by any other party; or
c. filed with any Governmental agency or other person or quoted or referred to in any public document.

This report has been prepared based on information provided by the Client and other parties. In preparing this report Epic:

a. presumed the accuracy of the information provided by the Client (including its representatives);
b. has not undertaken any verification to the accuracy or reliability included in this information (with the exception where such verification formed part of the scope of works);
c. has not undertaken any independent investigations or enquiries outside the scope of works with respect to information provided for this report; and
d. provides no warranty or guarantee, expressed or implied, as to the accuracy or reliability of the information provided in this report.

In recognition of the limited use of this report, the Client agrees that, to the maximum extent permitted by law, Epic (including its representatives and related entities) is not liable for any losses, claims, costs, expenses, damages (whether pursuant to statute, in contract or tort, for negligence or otherwise) suffered or incurred by the Client or any third party as a result of the information, findings, opinions, estimates, recommendations and conclusions provided in this report.
Without limiting the above, Epic (including its representatives and related entities) is not liable, in any way whatsoever:

a. for the use or reliance of this report for any purpose other than that for which it has been prepared;
b. for any use or reliance upon this report by any person other than the Client;
c. where another person has a different interpretation of the same information contained in the report;
d. for any consequential or indirect losses, or for loss of profit or goodwill or any loss or corruption of any data, database or software.

If a section of this disclaimer is determined by any court or other competent authority to be unlawful and/or unenforceable, the other sections of this disclaimer continue in effect. Where further information becomes available, or additional assumptions need to be made, Epic reserves its right to amend this report, but is not obliged to do so.

APPENDIX A DESKTOP SEARCH RESULTS

APPENDIX B FLORA SPECIES LIST AND SITE DATA (2022 AND 2024)

APPENDIX C SPECIES SURVEY EFFORT DATA TABLE

Table C1. Survey effort for TECs and threatened fauna for Mahalo North Project Study area – comparison with Commonwealth guidelines

Community/Species	Relevant Commonwealth documents	Survey requirements	Project survey effort
TECs			
Brigalow	*Approved Conservation Advice for the Brigalow (*Acacia harpophylla *dominant and co-dominant) ecological community* (DE 2013)	Patches of relevant Brigalow REs checked against key diagnostic characteristics and condition thresholds detailed in DE 2013	Relevant site data collected during vegetation surveys including: • 32 Quaternary survey sites • 20 Tertiary survey sites • 6 Biocondition survey sites
Natural Grasslands	*Commonwealth Listing Advice on Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* (TSSC 2009)	Patches of native grassland REs checked against key diagnostic characteristics and condition thresholds detailed in TSSC 2009	Not relevant – no grassland REs identified within Study area
Poplar Box on alluvial plains	*Conservation Advice (including listing advice) for the Poplar Box Grassy Woodland on Alluvial Plains* (DEE 2019)	Patches of Poplar Box on alluvium checked against key diagnostic characteristics and condition thresholds detailed in DEE 2019	Not relevant – no relevant Poplar Box woodland on alluvium identified within Study area
Threatened species			
Australian Painted Snipe (*Rostratula australis*)	*Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2* (DEWHA 2010)	Area searches for sites of less than 50 ha when water present (but not flooded) – 10 hr over 3 days Targeted stationary observations (dawn and dusk) – 10 hr over 5 days	2022 survey – water restricted to open dam sites (habitat unsuitable) – 4 hr survey effort at dam sites 2023 – water present in scattered gilgais (Togara only), 8 hr of stationary observations (over 4 days) at trap sites, additional 2 hr of survey effort elsewhere across site
Sharp-tailed Sandpiper (*Calidris acuminata*) Latham's Snipe (*Gallinago hardwickii*)	EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species	Non-tidal areas: • Timed to occur during summer migratory season in Australia and when water is present with a minimally vegetated, exposed margin • Ideally four surveys across period when majority of shorebirds are present	Surveys carried out over 4 days in early April (late in migrant season) and 5 days in late January-early February (within migrant season). Very little shorebird habitat observed. Water-filled gilgais (February 2023) generally occurred with heavy adjacent grass cover.
Squatter Pigeon (southern) (*Geophaps scripta scripta*)	*Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2* (DEWHA 2010)	Area searches (where less than 50 ha) for sites of less than 50 ha – 15 hr over 3 days Flushing surveys (where less than 50 ha) – 10 hr over 3 days	Study area is far larger than 50 ha. Approximately 22 hr of bird survey effort across 2022 and 2023 surveys. Bird surveys comprised both area searches and flushing survey.

Community/Species	Relevant Commonwealth documents	Survey requirements	Project survey effort
Painted Honeyeater (*Grantiella picta*)	No Commonwealth survey guideline	State guideline for species (Rowland 2012a) recommends: • Best timed to occur early spring to late summer • Area searches of 4 hr over 4 days in 50 ha of suitable habitat	Study area is far larger than 50 ha. Approximately 22 hr of bird survey effort across 2022 and 2023 surveys. Survey in 2023 carried out in late summer.
Koala (*Phascolarctos cinereus*)	No Commonwealth survey guideline for Koala. *A review of koala habitat assessment criteria and methods* (Youngentob 2021) consulted for identifying suitable forage tree species for region.	The *EPBC Act referral guidelines for the vulnerable koala* (DE 2012) are no longer in use but do at least suggest the following survey methods (but with no survey effort detailed): • Daytime strip transects • Spotlighting • Call playback during breeding season • Remote cameras • Mark recapture • Radio/satellite collars • Detection dogs	Surveys carried out over 4 days in early April and 5 days in late January-early February • Spotlighting surveys – 8 hrs • Approximately 16 hr of area searches in wooded habitat across 2022 and 2023 surveys
Ornamental Snake (*Denisonia maculata*)	*Draft Referral guidelines for the nationally listed Brigalow Belt reptiles v1.1* (DCCEEW 2023)	Range of methods: • Diurnal search – 1.5 person hour per hectare over 3 days • Spotlighting – 1.5 person hour per hectare over 3 days • Vehicle surveys – no effort detailed, best occurring after heavy rainfall in warm weather • Pitfall/funnel trapping – 6 x pitfall with 2 funnel along 30 m drift fence, 2 per habitat, carried out over 4 days	Surveys carried out over 4 days in early April and 5 days in late January-early February (in hot weather following heavy rainfall in region). • Passive nocturnal search – 8 hrs • Approximately 450 km of road and track searches across 2022 and 2023 surveys including regional driving to and from site • Funnel trapping – 118 trap nights at 4 sites, 2 sites for 4 nights and 2 for 3 nights
Grey Snake (*Hemiaspis damelii*)	No Commonwealth survey guideline	State guideline for species (Rowland 2012b) recommends: • Best timed to occur in January to March after heavy rainfall • Passive nocturnal search – 1 hr per hectare plot (3 plots where site greater than 5 ha), 2 survey periods	Surveys carried out over 4 days in early April and 5 days in late January-early February (in hot weather following heavy rainfall in region). • Passive nocturnal search – 8 hrs • Approximately 450 km of road and track searches across 2022 and 2023 surveys including regional driving to and from site

Community/Species	Relevant Commonwealth documents	Survey requirements	Project survey effort
		• Vehicle transect – approximately 250 km spread over 2 nights, 2 surveys • Diurnal search – 1 hr per 50 x 50 m plot (3 plots where site greater than 5 ha), 2 survey periods • Pitfall/funnel trapping – 50 trap nights/ha	• Funnel trapping – 118 trap nights at 4 sites, 2 sites for 4 nights and 2 for 3 nights

APPENDIX D FAUNA SPECIES LIST, TRAP SITE LOCATIONS, HABITAT ASSESSMENT DATA

Fauna species data collected on Togara and Meroo Downs properties for the Mahalo North Project by Epic Environmental personnel from 4-7 April 2022 and 30 January-3 February 2023. Only species listing under the Queensland NC Act is indicated. No species listed under the Commonwealth EPBC Act were recorded.

Table D1. Fauna species list for Mahalo North Project Study area

Species name	Common name	Status - NC Act*	Apr 22		Jan-Feb 23	
			Togara	Meroo Downs	Togara	Meroo Downs
Frogs						
Cyclorana alboguttata	Striped Burrowing Frog	LC	X		X	
Cyclorana novaehollandiae	Wide-mouthed Frog	LC			X	
Litoria caerulea	Green Tree Frog	LC	X		X	X
Litoria latopalmata	Broad-palmed Rocketfrog	LC			X	
Litoria peronii	Peron's Tree Frog	LC			X	
Limnodynastes salmini	Salmon-striped Frog	LC	X		X	
Limnodynastes tasmaniensis	Spotted Grass Frog	LC	X		X	
Limnodynastes terraereginae	Northern Banjo Frog	LC			X	
Platyplectrum ornatum	Ornate Burrowing Frog	LC	X		X	
Rhinella marina	Cane Toad	I	X		X	
Reptiles						
Gehyra dubia	Dubious Dtella	LC	X	X		
Oedura monilis	Ocellated Velvet Gecko	LC		X		X
Cryptoblepharus pulcher	Elegant Snake-eyed Skink	LC	X	X		
Carlia pectoralis	Open-litter Ranbow Skink	LC		X		
Carlia vivax	Lively Rainbow Skink	LC			X	
Ctenotus allotropis	Brown-blazed Wedgesnout Ctenotus	LC	X			
Ctenotus robustus	Robust Ctenotus	LC			X	
Ctenotus taeniolatus	Copper-tailed Skink	LC	X	X	X	
Egernia striolata	Tree Skink	LC				X
Morethia taeniopleura	Fire-tailed Skink	LC	X	X		
Diporiphora australis	Tommy Roundhead	LC	X	X	X	
Pogona barbata	Bearded Dragon	LC			X	X
Aspidites melanocephalus	Black-headed Python	LC			X	
Antaresia maculosa	Spotted Python	LC			X	
Cryptophis boschmai	Carpentaria Snake	LC			X	
Demansia psammophis	Yellow-faced Whipsnake	LC	X			
Pseudechis guttatus	Eastern Brown Snake	LC			X	
Suta suta	Curl Snake	LC	X			
Birds						
Dromaius novaehollandiae	Emu	LC		X		
Anas superciliosa	Pacific Black Duck	LC	X		X	
Chenonetta jubata	Wood Duck	LC			X	
Dendrocygna arcuata	Plumed Whistling Duck	LC		X	X	
Coturnix ypsilophora	Brown Quail	LC	X		X	X
Tachybaptus novaehollandiae	Australasian Grebe	LC		X		
Ardea pacifica	White-necked Heron	LC	X	X	X	
Egretta novaehollandiae	White-faced Heron	LC	X		X	
Anhinga novaehollandiae	Darter	LC			X	

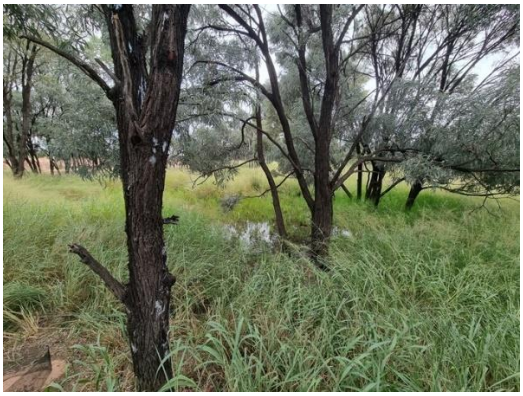
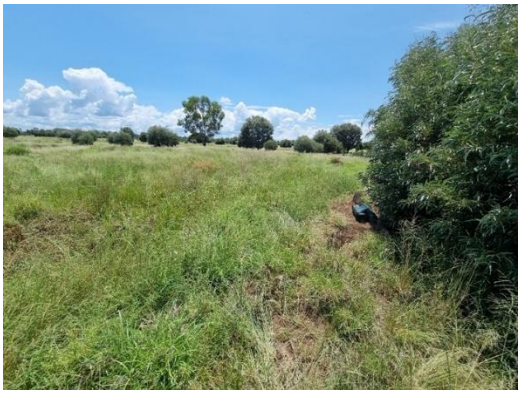
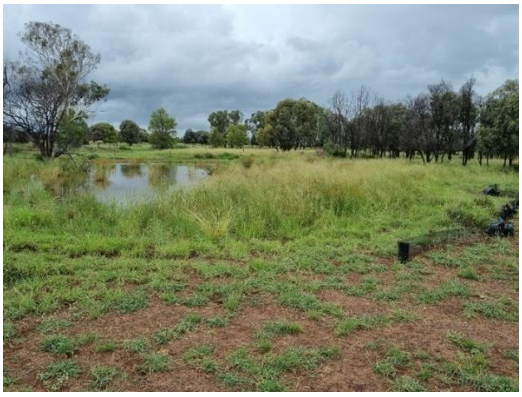
Species name	Common name	Status - NC Act*	Apr 22		Jan-Feb 23	
			Togara	Meroo Downs	Togara	Meroo Downs
Microcarbo melanoleucos	Little Pied Cormorant	LC		X	X	
Phalacrocorax sulcirostris	Little Black Cormorant	LC			X	
Aquila audax	Wedge-tailed Eagle	LC	X			X
Haliastur sphenurus	Whistling Kite	LC	X	X	X	X
Accipiter fasciatus	Brown Goshawk	LC		X		
Elanus axillaris	Black-shouldered Kite	LC		X		X
Ardeotis australis	Australian Bustard	LC	X		X	
Antigone rubicunda	Brolga	LC	X		X	
Vanellus miles	Masked Lapwing	LC	X	X	X	
Elseyornis melanops	Black-fronted Dotterel	LC		X		
Turnix velox	Little Button-quail	LC				X
Ocyphaps lophotes	Crested Pigeon	LC	X	X	X	X
Geopelia striata	Peaceful Dove	LC	X		X	
Geopelia humeralis	Bar-shouldered Dove	LC		X	X	X
Centropus phasianinus	Pheasant Coucal	LC	X	X	X	X
Scythrops novaehollandiae	Channel-billed Cuckoo	LC			X	
Cacomantis variolosus	Brush Cuckoo	LC			X	
Chalcites basalis	Horsfield's Bronze-cuckoo	LC			X	
Tyto javanica	Eastern Barn Owl	LC	X		X	
Ninox boobook	Australian Boobook	LC	X		X	
Podargus strigoides	Tawny Frogmouth	LC			X	
Aegotheles cristatus	Australian Owlet-nightjar	LC	X		X	
Dacelo novaeguineae	Laughing Kookaburra	LC	X	X	X	X
Todiramphus macleayii	Forest Kingfisher	LC			X	
Todiramphus pyrrhopygius	Red-backed Kingfisher	LC	X			
Merops ornatus	Rainbow Bee-eater	LC			X	X
Eurystomus orientalis	Dollarbird	LC			X	
Falco cenchroides	Nankeen Kestrel	LC	X	X		X
Falco berigora	Brown Falcon	LC	X	X	X	X
Falco longipennis	Australian Hobby	LC				X
Nymphicus hollandicus	Cockatiel	LC	X	X	X	X
Eolophus roseicapilla	Galah	LC	X	X	X	X
Cacatua galerita	Sulphur-crested Cockatoo	LC	X		X	
Trichoglossus moluccanus	Rainbow Lorikeet	LC			X	
Aprosmictus erythropterus	Red-winged Parrot	LC	X	X	X	
Platycercus adscitus	Pale-headed Rosella	LC	X	X	X	X
Chlamydera maculatus	Spotted Bowerbird	LC	X	X	X	
Oriolus sagittatus	Olive-backed Oriole	LC			X	
Malurus assimilis	Purple-backed Fairy-wren	LC	X	X		
Malurus melanocephalus	Red-backed Fairy-wren	LC			X	X
Lichmera indistincta	Brown Honeyeater	LC		X	X	
Plectorhyncha lanceolata	Striped Honeyeater	LC	X	X	X	X
Philemon citreogularis	Little Friarbird	LC		X	X	
Philemon corniculatus	Noisy Friarbird	LC			X	X
Entomyzon cyanotis	Blue-faced Honeyeater	LC	X		X	X
Melithreptus albogularis	White-throated Honeyeater	LC	X		X	
Manorina flavigula	Yellow-throated Miner	LC	X	X	X	X
Gavicalis virescens	Singing Honeyeater	LC	X	X	X	X

Species name	Common name	Status - NC Act*	Apr 22		Jan-Feb 23	
			Togara	Meroo Downs	Togara	Meroo Downs
Acanthagenys rufogularis	Spiny-cheeked Honeyeater	LC			X	
Pardalotus striatus	Striated Pardalote	LC	X		X	
Smicrornis brevirostris	Weebill	LC	X	X	X	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	LC	X		X	
Acanthiza nana	Yellow Thornbill	LC			X	
Pomatostomus temporalis	Grey-crowned Babbler	LC	X	X	X	X
Artamus cinereus	Black-faced Woodswallow	LC		X	X	X
Cracticus torquatus	Grey Butcherbird	LC	X	X		
Cracticus nigrogularis	Pied Butcherbird	LC	X	X	X	X
Gymnorhina tibicen	Australian Magpie	LC	X	X	X	X
Coracina novaehollandiae	Black-faced Cuckoo-shrike	LC	X	X	X	X
Coracina papuensis	White-bellied Cuckoo-shrike	LC	X			
Pachycephala rufiventris	Rufous Whistler	LC	X	X	X	X
Colluricincla harmonica	Grey Shrike-thrush	LC	X		X	X
Rhipidura albiscapa	Grey Fantail	LC	X			
Rhipidura leucophrys	Willie Wagtail	LC	X	X	X	X
Grallina cyanoleuca	Magpie-Lark	LC	X	X	X	X
Myiagra inquieta	Restless Flycatcher	LC	X			
Myiagra rubecula	Leaden Flycatcher	LC			X	X
Corvus coronoides	Australian Raven	LC	X	X	X	
Corvus orru	Torresian Crow	LC	X	X	X	X
Struthidea cinerea	Apostlebird	LC	X	X	X	X
Microeca fascinans	Jacky Winter	LC	X			
Petroica goodenovii	Red-capped Robin	LC	X			
Dicaeum hirundinaceum	Mistletoebird	LC				X
Mirafra javanica	Horsfield's Bushlark	LC	X	X	X	X
Megalurus mathewsi	Rufous Songlark	LC			X	X
Cisticola exilis	Golden-headed Cisticola	LC				X
Petrochelidon nigricans	Tree Martin	I	X			
Acridotheres tristis	Common Myna	LC	X	X	X	X
Neochmia modesta	Plum-headed Finch	LC			X	X
Taeniopygia guttata	Zebra Finch	LC	X	X	X	X
Taeniopygia bichenovii	Double-barred Finch	LC	X	X	X	X
Anthus australis	Australian Pipit	LC		X	X	X
Mammals						
Tachyglossus aculeatus	Short-beaked Echidna	SLC	Tracks		X	
Aepyprymnus rufescens	Rufous Bettong	LC	Tracks			
Macropus giganteus	Eastern Grey Kangaroo	LC	X	X	X	
Chaerophon jobensis	Greater Northern Free-tailed Bat	LC	X		X	
Saccolaimus flaviventris	Yellow-bellied Sheathtail Bat	LC	X		X	
Ozimops lumsdenae	Northern Free-tailed Bat	LC	X		X	
Ozimops ridei	Ride's Free-tailed Bat	LC	X		X	
Chalinolobus gouldi	Gould's Wattled Bat	LC	X		X	
Chalinolobus morio	Chocolate Wattled Bat	LC	X		X	
Chalinolobus picatus	Little Pied Bat	LC	X		X	
Miniopterus orianae oceanensis	Eastern Bentwing Bat	LC	X		X	

Species name	Common name	Status - NC Act*	Apr 22		Jan-Feb 23	
			Togara	Meroo Downs	Togara	Meroo Downs
Nyctophilus sp.	long-eared bat species	LC	X		X	
Scotorepens balstoni	Inland Broad-nosed Bat	LC	X		X	
Scotorepens greyii	Little Broad-nosed Bat	LC	X		X	
Mus musculus	House Mouse	I			X	
Oryctolagus cuniculus	Rabbit	I	X		X	
Canis lupus dingo	Dingo			X		
Felis catus	Cat	I	X	X		
Sus scrofa	Pig (scats)	I	Scats	X		

*Status abbreviations: LC = Least Concern; I = Introduced

Table D2. Trap site description and species data (January-February 2023)

Site/coordinates	Description/species recorded	Photo
Site 1 -24.0562 148.64384	Funnel trap line: small patch of Brigalow with scattered Blackbutt located adjacent to small waterhole on lower slope of farm dam area. Tall grass and dense aquatic vegetation present. Elliott trap line located in nearby patch of relatively intact Poplar Box woodland. Species recorded: Striped Burrowing Frog, Wide-mouthed Frog, Green Tree Frog, Salmon-striped Frog, Northern Banjo Frog, Ornate Burrowing Frog, Lively Rainbow Skink, Robust Ctenotus, House Mouse.	
Site 2 -24.0486 148.6723	Funnel trap line: small waterhole in gilgai along drainage area. Dense grass and aquatic vegetation present. Very little woody vegetation present (scattered regrowth Brigalow). Species recorded: Striped Burrowing Frog, Green Tree Frog, Spotted Grass Frog	
Site 3 -24.03338 148.65908	Funnel trap line: large waterhole in wide shallow gilgai. Water present in other gilgais surrounding site. Dense grass and aquatic vegetation present but patchy. Cattle disturbance present. Some woody vegetation present (scattered regrowth Brigalow). Species recorded: Striped Burrowing Frog, Wide-mouthed Frog, Broad-palmed Rocket Frog, Peron's Tree Frog, Ornate Burrowing Frog	

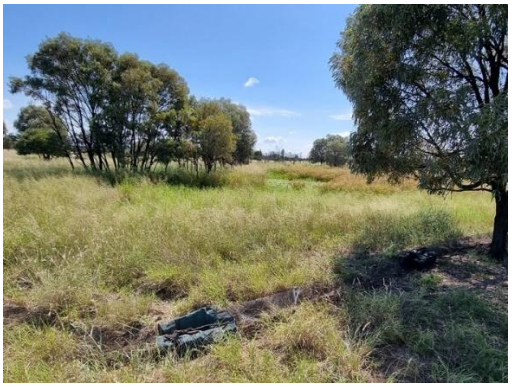
Site/coordinates	Description/species recorded	Photo
Site 4 -24.05416 148.63689	Funnel trap line: large waterhole in wide shallow gilgai. Dense grass and aquatic vegetation present. Very little woody vegetation present (scattered regrowth Brigalow). Species recorded: Green Tree Frog, Salmon-striped Frog, Northern Banjo Frog, Carpentaria Snake.	

Table D3. Habitat assessment data (2022 and 2023)

Site ID	MH1	MH2	MH3	MH4
Date	4/4/2022	4/4/2022	4/4/2022	4/4/2022
Latitude	-24.03078763	-24.05094533	-24.04485942	-24.04239368
Longitude	148.7121475	148.7048199	148.6957035	148.6959773
Native grass cover	Moderate <40%	Moderate <40%	Dense >40%	Moderate <40%
Tree cover	Sparse	Moderate	Sparse	Sparse
Koala trees	e. cambageana	e cambageana	no	no
Tree hollows	Common, mainly small	Sparse, some large trees present with big hollows		Sparse, some large dead stags with decent hollows
Woody debris	Common	Common	Not	Common
Gilgais	no	no	no	no
Cracking soils	no	no	no	no
Rocky habitat				
Water presence				
Cattle disturbance	Light	Light	Light	Light
Site notes	Blackbutt with small Brigalow, sandy surface with small surface rocks		non remnant, mostly skinny regrowth acacia with e melanophloia	mapped as remnant, sparse largish e melanophloia with gidgee
Site ID	**MH5**	**MH6**	**MH7**	**MH8**
Date	4/4/2022	4/4/2022	4/4/2022	5/4/2022
Latitude	-24.05523682	-24.05826678	-24.04455157	-24.04883793
Longitude	148.6725275	148.667307	148.658124	148.6384555
Native grass cover	Moderate <40%	Sparse <10%		Dense >40%
Tree cover	Cleared	Cleared	Cleared	Cleared
Koala trees	no	no	no	no
Tree hollows				
Woody debris	Not	Not	Not	Not
Gilgais	no	no	wide low relief gilgais present	very low relief and grassy
Cracking soils	no	no	scattered areas of moderate sized cracks present	very sparse small cracking, appears to have been blade ploughed
Rocky habitat				
Water presence				
Cattle disturbance	Light	Moderate	Light	Light
Site notes	cleared weedy grass, some shrubs about, well site	cleared and trashed spot. few shrubs, sandy soils, well site	light brown clays, scattered regrowth bri	cleared with scattered brigalow regrowth, poor o snake habitat
Site ID	**MH9**	**MH10**	**MH11**	**MH12**
Date	5/4/2022	5/4/2022	5/4/2022	5/4/2022
Latitude	-24.05577728	-24.03354465	-24.02530577	-24.02730133
Longitude	148.6661075	148.6427124	148.6326625	148.6321849
Native grass cover	Moderate <40%	Dense >40%	Moderate <40%	Moderate <40%
Tree cover	Sparse	Cleared	Sparse	Moderate
Koala trees	sparse gums although uncertain value	no	poplar box	poplar box
Tree hollows	Sparse, some large trees but mostly only small hollows	Sparse, some large hollows in scattered black butt in area	Sparse, odd small hollows present	hollows present but mostly small
Woody debris	Common	Not	Sparse	Common
Gilgais	no	shallow scattered wide gilgais	no	no
Cracking soils	no	light brown, good cracks present	no	sandy surface, land zone 5
Rocky habitat				
Water presence				
Cattle disturbance	Light	Light	Light	Light

Site notes	sparse woodland with large trees and varied lower storey, shrubs sparse	drainage depression area, habitat quite localised - gilgias/cracks disappear away from point, mostly cleared some regrowth brigalow, moderate o snake habitat	mapped remnant but definitely isn't, scattered tall regrowth poplar box	moderately tall regrowth poplar box with good understorey - wilga & false sandalwood- mapped as 11.4.9 (wrong)
Site ID	**MH13**	**MH14**	**MH15**	**MH16**
Date	5/4/2022	5/4/2022	5/4/2022	6/4/2022
Latitude	-24.01995193	-24.01582758	-24.03472502	-24.03980458
Longitude	148.623158	148.6189031	148.6315117	148.6226978
Native grass cover	Moderate <40%	Sparse <10%	Dense >40%	Moderate <40%
Tree cover	Moderate	Moderate	Cleared	Moderate
Koala trees	blackbutt	poplar box	no	e. cambageana
Tree hollows	Sparse, some small hollows present	Sparse, some small hollows with odd large hollows in scattered mature poplar box		
Woody debris	Common	Common	Not	Common
Gilgais	no	no	scattered wide shallow gilgais	decent gilgais present in patches
Cracking soils	no	no	only present in base of some gilgais, stoney surface elsewhere, likely ought at some stage	some present but cattle damage obvious
Rocky habitat				
Water presence				
Cattle disturbance	Light	Light	Light	Moderate
Site notes	brigalow with blackbutt on sand, no gilgais present, in general good habitat for ground fauna	large regrowth, complex habitat on sandy soils, poplar box and brigalow over quite dense shrub layer, good habitat for fauna in general	possible o snake habitat but very minor value, scattered brigalow in area, some subject to poisoning	regrowth brigalow with a sparse understorey and scattered gums, moderate o snake habitat but subject to cattle damage
Site ID	**MH17**	**MH18**	**MH19**	**MH20**
Date	5/4/2022	5/4/2022	5/4/2022	6/4/2022
Latitude	-24.0353658	-24.05397323	-24.02340098	-24.02780952
Longitude	148.6113809	148.6254743	148.6660674	148.6759607
Native grass cover		Moderate <40%	Dense >40%	Moderate <40%
Tree cover	Cleared	Sparse	Sparse	Moderate
Koala trees	no	poplar box - sparse, many dead trees	unnamed gums	no
Tree hollows		Sparse, sparse small hollows in poplar box regrowth	Sparse, few tall trees present and not hollow forming, some small present	
Woody debris	Not	Common	Sparse	Common
Gilgais	scattered large shallow gilgais	no	no	no
Cracking soils	decent cracking observed in gilgais	no	no	no
Rocky habitat				
Water presence				
Cattle disturbance	Moderate	Moderate	Light	Light
Site notes	gilgais with decent cracking, moderate potential o snake habitat, scattered brigalow regrowth subject to poisoning	sparse poplar box layer with more dense shrub layer dominated by wilga	scattered large trees with a similar scattered shrub and lower storey layer	pure Acacia argyrodendron stand, lots fallen timber but all quite small
Site ID	**MH21**	**MH22**	**MH23**	**MH24**
Date	6/4/2022	6/4/2022	6/4/2022	6/4/2022

Latitude	-24.06584087	-24.05558082	-24.04685002	-24.04735282
Longitude	148.6082575	148.6017162	148.593465	148.5914605
Native grass cover	Moderate <40%	Dense >40%	Dense >40%	Dense >40%
Tree cover	Sparse	Cleared	Cleared	Cleared
Koala trees	no	no	no	no
Tree hollows	Sparse, sparse larger trees but occasional hollows, some big			
Woody debris	Common	Not	Not	Not
Gilgais	no	no	no	no
Cracking soils	no	no	no	no
Rocky habitat				
Water presence				
Cattle disturbance	Light	Light	Light	Light
Site notes	not mapped, probs cat c regrowth Inc variety of trees: gidgee, e melanophloia, patchy cover of canopy and lower storey trees, well in cleared spot	cleared and ploughed, brown solid clay possibly once gilgaied, dominated by weedy grasses Inc buffeld,	sandier surface than previous, heavy buffel cover	as previous although grass cover dominated by native pigeon grass
Site ID	**MH25**	**MH26**	**MH27**	**MH28**
Date	6/4/2022	6/4/2022	6/4/2022	6/4/2022
Latitude	-24.03739388	-24.03534303	-24.05657353	-24.04804165
Longitude	148.5904247	148.5574947	148.5468366	148.5587495
Native grass cover	Dense >40%	Dense >40%	Sparse <10%	Dense >40%
Tree cover	Cleared	Cleared	Moderate	Cleared
Koala trees	no	no	coolibah	no
Tree hollows			Sparse, only small hollows visible, larger ones likely closer to creek	
Woody debris	Not	Not	Common	Not
Gilgais	no	no	low depth channelised gilgai on loose brown alluvial soil	no
Cracking soils	no	no	no	no
Rocky habitat				
Water presence			Comet River nearby	
Cattle disturbance	Light	Light	None	Light
Site notes	as before, blue ploughed, probs once gilgaied, dense cover of natives and buffel	reddish soil, as per previous, cleared and cattle present, grasses native and weedy	good quality brigalow and coolibah habitat, west of site works, potential o snake habitat although no soil cracks	as per previous, cleared, mix of native and weedy grass cover
Site ID	**MH29**	**MH30**	**MH31**	**MH32**
Date	6/4/2022	6/4/2022	6/4/2022	6/4/2022
Latitude	-24.0624799	-24.07688858	-24.08054225	-24.09344127
Longitude	148.5706103	148.5755931	148.5716047	148.5598178
Native grass cover	Moderate <40%	Dense >40%	Dense >40%	Dense >40%
Tree cover	Cleared	Cleared	Riparian	Cleared
Koala trees	no	no	coolibah	no
Tree hollows			Common, large hollows in the coolibah	
Woody debris	Not	Not	Common	Not
Gilgais	no	no	no	no
Cracking soils	no	sparse but large cracks present	no	no
Rocky habitat				
Water presence			waterhole in creek	
Cattle disturbance	Heavy	None	Moderate	

Site notes	cleared paddock near yards, grass cover mostly buffel and very degraded, scattered small regrowth brigalow with bauhinia, currant bush and few others, poor habitat value, ri	lignum, grass and other stuff, floodplain,, area used for cropping at times	thin riparian corridor along creek, coolibah and m. decora, water present, large trees, brigaliw away from creek, fewer large trees west of point	potential pipeline route, cultivated paddock to west, cleared grazing grassland to east
Site ID	**MH33**	**MH34**	**MH35**	**MH36**
Date	6/4/2022	6/4/2022	6/4/2022	6/4/2022
Latitude	-24.06985432	-24.07746102	-24.07759275	-24.07823017
Longitude	148.6011164	148.6042708	148.6200284	148.6174355
Native grass cover	Moderate <40%	Sparse <10%	Dense >40%	Sparse <10%
Tree cover	Cleared	Cleared	Cleared	Moderate
Koala trees	no	no	no	occasional poplar box
Tree hollows				Sparse, few small hollows present
Woody debris	Sparse	Not	Not	Common
Gilgais	no	no	no	no
Cracking soils	no	no	no	no
Rocky habitat		Yes - exposed surface stones	Yes - large surface rocks	
Water presence			dam downhill from site	dam downhill from site
Cattle disturbance	Light	Heavy	Light	None
Site notes	cleared and ploughed like the rest of it, scattered small acacias, sloping to west	scorched either, sheet erosion evident, few grasses present	more ploughed grassland, occasional shrubby Cassia brewsteri	brigalow, some poplar box, bottle trees and vine thicket species, degraded with canopy die back, but nice habitat
Site ID	**MH37**	**MH38**	**MH39**	**MH40**
Date	6/4/2022	7/4/2022	7/4/2022	7/4/2022
Latitude	-24.06079833	-24.06815173	-24.08145247	-24.0881808
Longitude	148.6418898	148.6288211	148.6175746	148.6175135
Native grass cover	Dense >40%	Dense >40%	Sparse <10%	Dense >40%
Tree cover	Cleared	Cleared	Moderate	Cleared
Koala trees	no	no	no	no
Tree hollows				
Woody debris	Not	Sparse	Common	Sparse
Gilgais	no	no	not gilgais but minor drainage channels	no gilgais, previously blade ploughed
Cracking soils	no	no	no	good dark cracking clay soils to north
Rocky habitat				
Water presence				
Cattle disturbance	Light	Light	Moderate	Moderate
Site notes	more cleared grassland, blade ploughed, native and weedy grasses	more cleared and ploughed grassland, scattered small Acacia leiocalyx	brigalow/sevt community, possible TEC, some die back in canopy but good lower storey coverage, nice habitat although somewhat disturbed by cattle and easement clearing, dam nearby	cleared grassland north of fenceline well cracked and frogs present, possible o snake habitat likely to be blade ought in near future, dam adjacent
Site ID	**MH41**	**MH42**	**MH43**	**Mfeb1**
Date	7/4/2022	7/4/2022	7/4/2022	1/2/2023
Latitude	-24.0593535	-24.0485312	-24.03987443	-24.0581559
Longitude	148.6489591	148.6723833	148.6869869	148.5478737
Native grass cover	Moderate <40%	Dense >40%	Moderate <40%	Dense >40%
Tree cover	Moderate	Cleared	Sparse	Riparian
Koala trees	odd blackbutt	no	clarkson's bloodwood	Moderate

Tree hollows			Common, mostly small hollows present but few larger ones about	Sparse
Woody debris	Sparse	Not	Sparse	Common
Gilgais	on a shallow drainage depression	no gilgais but drainage depression	no	no
Cracking soils	some large cracks present off road	minor soil cracking evident	no	uncertain due to dampness, cracks possibly closed over
Rocky habitat				
Water presence				
Cattle disturbance	Moderate	Light	Light	None
Site notes	regrowth brigalow along road, more extensive than mapped (cat c)	mapped as regrowth (cat c) but incorrect, scattered small brigalow only, minor o snake potential	tall regrowth with a patchy canopy, sandy surface, dominated by callitris and bloodwood	Eucalyptus cambageana along anabranch of Comet R with Melaleuca bracteata and brigalow immediately offstream.Ample water present in creek at time.
Site ID	**Mfeb2**	**Mfeb3**	**Mfeb4**	**Mfeb5**
Date	1/2/2023	1/2/2023	1/2/2023	1/2/2023
Latitude	-24.0608696	-24.0602559	-24.0775878	-24.0849754
Longitude	148.5439534	148.5910225	148.6361195	148.6394222
Native grass cover	Dense >40%	Sparse <10%	Sparse <10%	Sparse <10%
Tree cover	Riparian	Cleared	Sparse	Sparse
Koala trees	Sparse and immature	no	Sparse and immature	no
Tree hollows	Sparse			
Woody debris	Common	Sparse	Not	Not
Gilgais	no	no	no	no
Cracking soils	uncertain, cracks possibly closed over due to wet weather	blade ploughed, clay soil with a sandy cover, no cracks	no	no
Rocky habitat			Yes - edge of land zone 7 rocky ridge, small exposed rocky areas	
Water presence	comet river			small dam
Cattle disturbance	None	Light	Moderate	Moderate
Site notes	Eucalyptus cambageana with dense lower storey of brigalow, casuarina cristata, bauhinia and other dry rainforesty stuff. too dense to get to river. Tall weedy grass layer (poss Guinea grass). Brigalow dominant between anabranch and river.	regrowth Acacia over buffel, no soil structure suitable for ornamental snake	mostly cleared, on Ridge-silver- leaf ironbark, kurrajong and few acacias, downhill almost totally cleared with regrowth acacia, looks west to proposed well site	buffel dominated paddock next to eroded gully and small dam, few small regrowth trees present, mainly along gully
Site ID	**Funnel1**	**elliot1**	**funnel3**	**funnel4**
Date	1/2/2023	1/2/2023	1/2/2023	2/2/2023
Latitude	-24.0562005	-24.0573656	-24.0333805	-24.0541578
Longitude	148.6438459	148.6435619	148.6590812	148.6368932
Native grass cover	Sparse <10%	Moderate <40%	Moderate <40%	Moderate <40%
Tree cover	Sparse	Moderate	Sparse	Sparse
Koala trees	Sparse and immature	Moderate	no	no
Tree hollows		Sparse, most trees too immature but some large trees with large hollows present		
Woody debris	Not	Sparse	Not	Not
Gilgais	yes	no	shallow gilgais (<50cm) present of varying size	wide shallow gilgais, water present at time

Cracking soils	uncertain due to wet weather, may have closed cracks over	sandy soil	uncertain, cattle damage and recent rain, hard brown clays	possibly closed because of wet weather, cattle impact present
Rocky habitat				
Water presence	dam and gilgai waterhole	dam and gilgais	gilgais with watet	gilgai
Cattle disturbance	Light	Light	Moderate	Heavy
Site notes	waterfalls gilgai with regrowth blackbutt and brigalow beside dam area.	mixture of blackbutt with poplar box and brigalow, decent shrub layer, some large woody debris present but not lots	regrowth brigalow in cleared area around several shallow gilgais with water at time of survey. trap site beside large waterbody.	sparse brigalow around gilgais, appears good habitat for ornamental snake, as with everywhere else little evidence of soil cracks
Site ID	**Mfeb7**	**Elliot3**	**funnel2**	**Mfeb8**
Date	2/2/2023	2/2/2023	2/2/2023	2/2/2023
Latitude	-24.0562916	-24.0604667	-24.0485991	-24.0204173
Longitude	148.6216966	148.6632735	148.6723042	148.6156712
Native grass cover	Moderate <40%	Moderate <40%	Moderate <40%	Dense >40%
Tree cover	Moderate	Sparse	Sparse	Cleared
Koala trees	Moderate	Sparse and immature	no	no
Tree hollows	Sparse, not many large trees, lot of dead smaller trees probably providing small hollows	Sparse, scattered but few large trees with some very big hollows		
Woody debris	Sparse	Sparse	Not	Not
Gilgais	no	no	shallow gilgais present, water present along drainage	no
Cracking soils	no	brown hard clay	dark brown clay soil, no cracking evident, could be weather related plus cow degradation	light brown hard clay, no evidence of cracking g
Rocky habitat				
Water presence			water filled gilgai	
Cattle disturbance	Light	Light	Light	Moderate
Site notes	Eucalyptus melanophloia dominant canopy, some poplar box with kurrajong and wilga, quite open, evidently cleared or thinned in past, not a GDE	scattered large bloodwoods with silver-leaf ironbark and scattered lower storey and shrub layer of vine thicket species - red ash, wilga - quite diverse	gilgai with very shallow water present next to site densely vegetated	cleared area in north, sparesly scattered low brigalow present, borders woodland dominated by poplar box. not ornamental snake habitat
Site ID	**Elliott2**			
Date	2/2/2023			
Latitude	-24.039758			
Longitude	148.6860567			
Native grass cover	Moderate <40%			
Tree cover	Moderate			
Koala trees	Moderate			
Tree hollows	Sparse, few large eucalypts present some large hollows			
Woody debris	Sparse			
Gilgais	no			
Cracking soils	hard brown clay soil			
Rocky habitat				
Water presence				
Cattle disturbance	Light			
Site notes	bloodwoods and small ironbark with tall acacias, callitris and red ash evidently thinned in the past			

APPENDIX E DES Landscape Fragmentation and Connectivity Tool Output

SIGNIFICANCE TEST ONE

The regional total area is 228048.76
The regional extent of core remnant is 25743.36
The regional extent of core remnant is 11.29 percent
This level of regional fragmentation sets a local impact threshold of: 5.0 percent

The table below lists the local impact thresholds for categories of regional core remnant extent:

REGIONAL CORE CATEGORY	LOCAL IMPACT THRESHOLD
< 10	2.0
10 - 30	5.0
30 - 50	10.0
50 - 70	20.0
70 - 90	30.0
>90	50.0

Area of core at the local scale (pre impact): 3548.41
Area of core at the local scale (post impact): 3538.3
Percent change of core at the local scale (post impact): 0.28 percent

SIGNIFICANCE TEST TWO

The number of core remnant areas occurring on the site: 3
The number of core remnant areas remaining on the site post impact: 3
(Only core polygons greater than or equal to 1 hectare are included)

RESULT

14:31:13 This analysis has determined any impact on connectivity areas is NOT significant
(A significant reduction in core remnant at the local scale is False OR a change from core to non-core remnant at the site scale is False)

CONTACT US

www.epicenvironmental.com.au
X800 779 363
enquiries@epicenvironmental.com.au

http://www.epicenvironmental.com.au/