Appendix A: PL 1087 Ecological Assessment (ELA, 2022)

PL 1087 – Ecology Assessment Report

Santos Limited

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Abbreviations

Abbreviation	Description
ALA	Atlas of Living Australia
AOO	Area of occupancy
API	Aerial Photographic Interpretation
DBH	Diameter at Breast Height
DEM	Digital Elevation Model
DotEE	Commonwealth Department of the Environment and Energy
EA	Environmental Authority
ELA	Eco Logical Australia Pty Ltd
EO Reg	Queensland *Environmental Offsets Regulation 2014*
EOO	Extent of occurrence
EP Act	*Environmental Protection Act 1994*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESA	Ecologically Sensitive Areas

Abbreviation	Description
EVNT	Endangered, Vulnerable and Near Threatened
GIS	Geographic Information System
ha	Hectare
IBRA	Interim Biogeographical Regions of Australia
MNES	Matters of National Environmental Significance
MSES	Matters of State Environmental Significance
NCA	Queensland *Nature Conservation Act 1992*
PL	Petroleum Lease
QLD	Queensland
RDP	Rapid Data Point
RE	Regional Ecosystem
SAM	South Australian Museum
SPP	State Planning Policy
TEC	Threatened Ecological Community
VMA	Queensland *Vegetation Management Act 1999*

Executive Summary

Santos Limited (Santos) proposes to expand existing operations within Petroleum Lease (PL) 1087 (the study area).

A desktop assessment of environmental values was undertaken followed by an ecological field survey from 18 to 20 January 2020 in PL 1087 to determine the presence of, or potential habitat for Matters of National Environmental Significance (MNES) protected under the Federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Matters of State Environmental Significance (MSES) protected under relevant Queensland legislation.

The field survey recorded a total of 61 flora species, 24 fauna species and mapped 10 regional ecosystems (REs) in PL 1087. No threatened species or threatened ecological communities listed under Queensland or Federal legislation were recorded. However, the following MNES and MSES were considered as potential, likely or known to occur within the study area including:

- Potential threatened species habitat for Grey Falcon (*Falco hypoleucos*), Painted Honeyeater (*Grantiella picta*), Woma (*Aspidites ramsayi*), Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) and *Indigofera oxyrachis*
- Potential migratory species habitat for the Fork-tailed Swift (*Apus pacificus*)
- Regulated vegetation - intersecting a watercourse
- Regulated vegetation - within 100 m of a Vegetation Management Wetland.

At the time of survey, the study area was grazed and drought affected with very few living plant species present in the ground layer. The study area consists primarily of rolling stony *Astrebla pectinata* (Mitchell Grass) plains, a variety of shrublands, very open woodlands and riparian woodlands all dominated by a variety of *Acacia* species. During prolonged dry conditions the majority of flora persists in the soil seedbank, however following significant rainfall the diversity and cover of the study area would increase dramatically. Fauna populations were also considered low at the time of survey with only seven mammal and 17 bird species being recorded. While good structural habitat was present in many areas, the general lack of flowering and seeding plants as well as permanent water sources is likely to have restricted the diversity and abundance of fauna populations.

Future development activities within PL 1087 may result in disturbance to approximately 64 ha of mapped REs and habitat values. Large expanses of the study area are treeless, comprised of open herblands and open grasslands. This creates an opportunity for Santos to avoid and minimise impacts to more structurally diverse and important ecosystems, and therefore reduce impacts on threatened species. A number of management practices have been proposed to ensure impacts are avoided and minimised as far as possible.

A residual risk impact assessment of these impacts against relevant policy guidance was undertaken and is provided in this report. The assessment concluded that impacts to MNES and MSES either known or potentially occurring within the study area were not considered significant, provided clearing of regulated vegetation – intersecting a watercourse and regulated vegetation – within 100 m of a Vegetation Management Wetland complies with clearing limits.

1. Introduction

1.1 Project background

Eco Logical Australia (ELA) understands that Santos are looking to expand their operations in PL 1087. The proposed operations will impact on approximately 64 hectares (ha) within PL 1087. ELA has previously prepared a biodiversity and residual risk assessment for protected matters within PL 80 which directly adjoins PL 1087 to the east and contains a range of similar habitats.

1.2 Objectives and scope of works

The objective of this assessment is to validate the ecological values within the study area using both desktop and field verified data and to undertake an impact assessment of the proposed expansion of operations on identified Matters of National Environmental Significance (MNES) and Matters of State Environmental Significance (MSES).

Specifically, the scope of works includes:

- Ground-truthing regional ecosystem (RE) type and condition (Queensland RE Framework).
- Validating habitat values, particularly species protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and Queensland *Nature Conservation Act 1992* (NC Act).
- Assessing the condition and extent of Threatened Ecological Communities (TECs) that may occur within the area.
- Determining the likelihood of significant impacts to MNES and MSES.
- Providing avoidance, mitigation and management strategies to reduce the severity and magnitude of potential impacts.
- Evaluating significant residual impacts to identified MNES and MSES.

1.3 Study area

PL 1087 encompasses a total area of approximately 8,235 ha (herein referred to as the study area; **Figure 1**). The study area consisted predominantly of grazed remnant vegetation, currently representing degraded or highly drought affected habitat. Riparian vegetation within the study area is associated with the ephemeral tributaries of Cooper Creek that were dry at the time of the field surveys. The study area contains some existing infrastructure including gas wells, pipelines, borrow pits and roads.

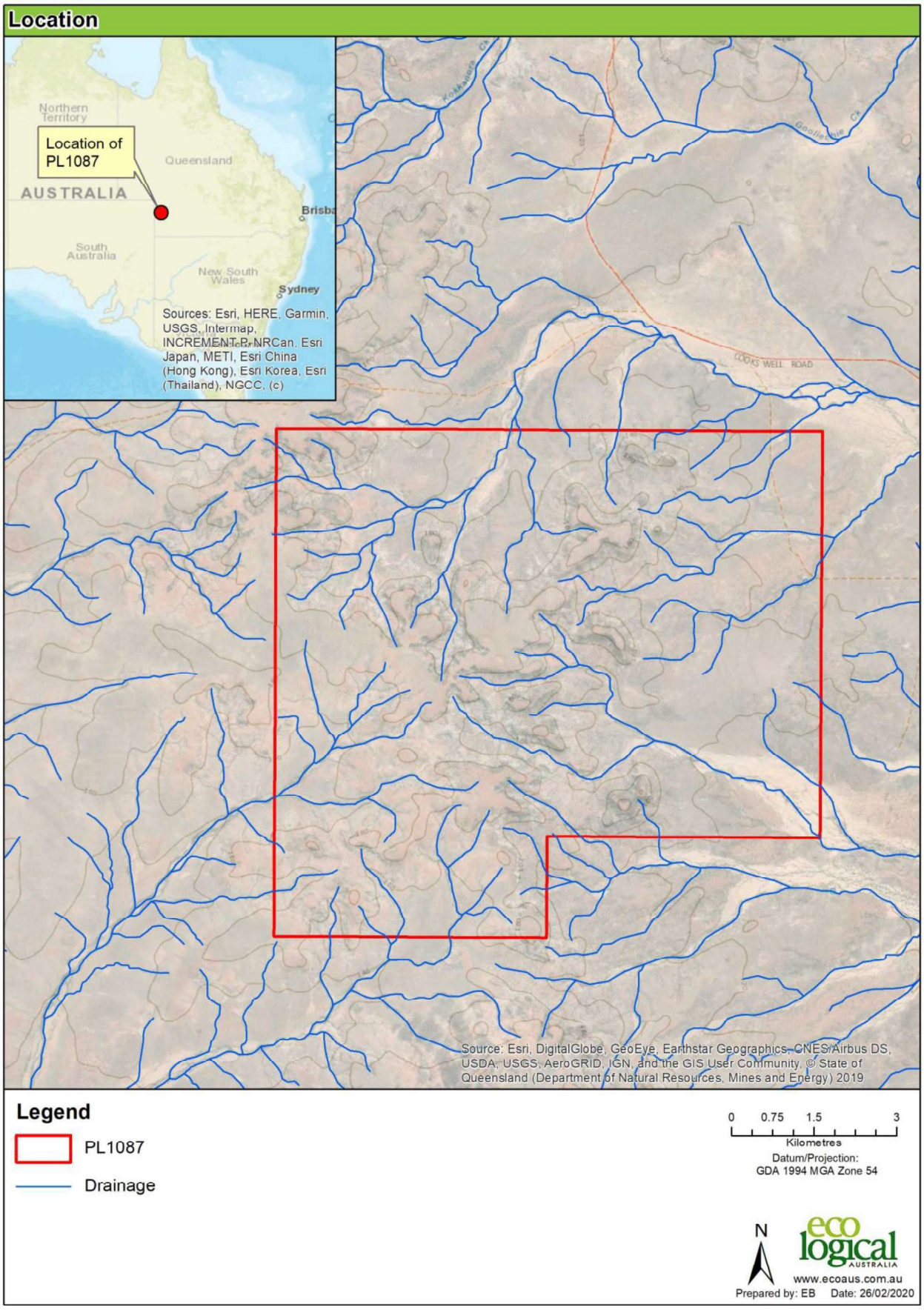

Figure 1: Study area and location

2. Methodology

2.1 Desktop assessment

A desktop assessment was undertaken to review existing data and to identify the presence of ecological values occurring within the study area. The desktop assessment involved a review of environmental databases, maps, literature and digital datasets. Results were used to compile a likelihood assessment (**Appendix A**), which identified the target threatened species and any potential habitat types within the study area. Survey methods and effort were based on this information.

2.1.1 Database searches

Database searches were performed using the EPBC Act Protected Matters Search Tool and Wildlife Online (QLD) databases, based on a central coordinate of -27.141, 141.707 with a 100 km buffer. A MSES report was requested for the study area. Atlas of Living Australia (ALA) records for listed threatened species were also downloaded and added to a Geographical Information System (GIS).

All database searches were undertaken during 2020 prior to the field survey and revised on 30/09/2021.

2.1.2 Datasets utilised

A range of datasets were used in this project including high resolution (20 cm) aerial imagery, a 1 second (30 m) digital elevation model (DEM), existing RE mapping, drainage mapping, rapid data point (RDP) data and BioCondition site assessment data (**Table 1**).

Table 1: Data sources

Data	Purpose
High resolution (20 cm) aerial imagery	District patterns in the imagery representing RE boundaries were identified, linework digitised and attributed.
Digital Elevation Model (DEM)	A moderate resolution (30 m) DEM was utilised to both identify areas with moderate to steep slopes (i.e. rocky slopes leading to tablelands), as well as identifying boundaries between alluvial and non-alluvial areas. The DEM was used to identify appropriate land zones to inform RE attribution. The DEM was also used to generate fine-scale 0.5 m and 1 m contours. The resulting terrain dataset is shown on **Figure 2**.
RE Mapping	State-wide mapping was reviewed for potential REs and associated fauna habitat values within the study area.
Vegetation survey data including: RDPs and BioCondition plots undertaken as part of this project.	Field survey data was used to identify vegetation communities, classify soils and landforms and assign REs and fauna habitats. All RDP and BioCondition sites utilised in the development of this study are presented in **Figure 3** with BioCondition profiles in **Appendix C**.
Geological mapping (Department of Natural Resources and Mines (2005)	Primary geological units informed soil classification and RE attribution.

2.1.3 Likelihood of occurrence assessment

The likelihood of occurrence of each threatened and migratory species identified in the desktop assessment was assessed based on the species' known distribution, habitat quality and extent of potential habitat within the study area, species' occurrence within the region and species' occurrence within the study area. Each species was assessed as known, likely, potential or unlikely to occur within the study area, based on the criteria outlined in **Table 2**. Likelihood assessments were undertaken as part of the desktop assessment and updated post-field survey to include survey results (**Appendix A**).

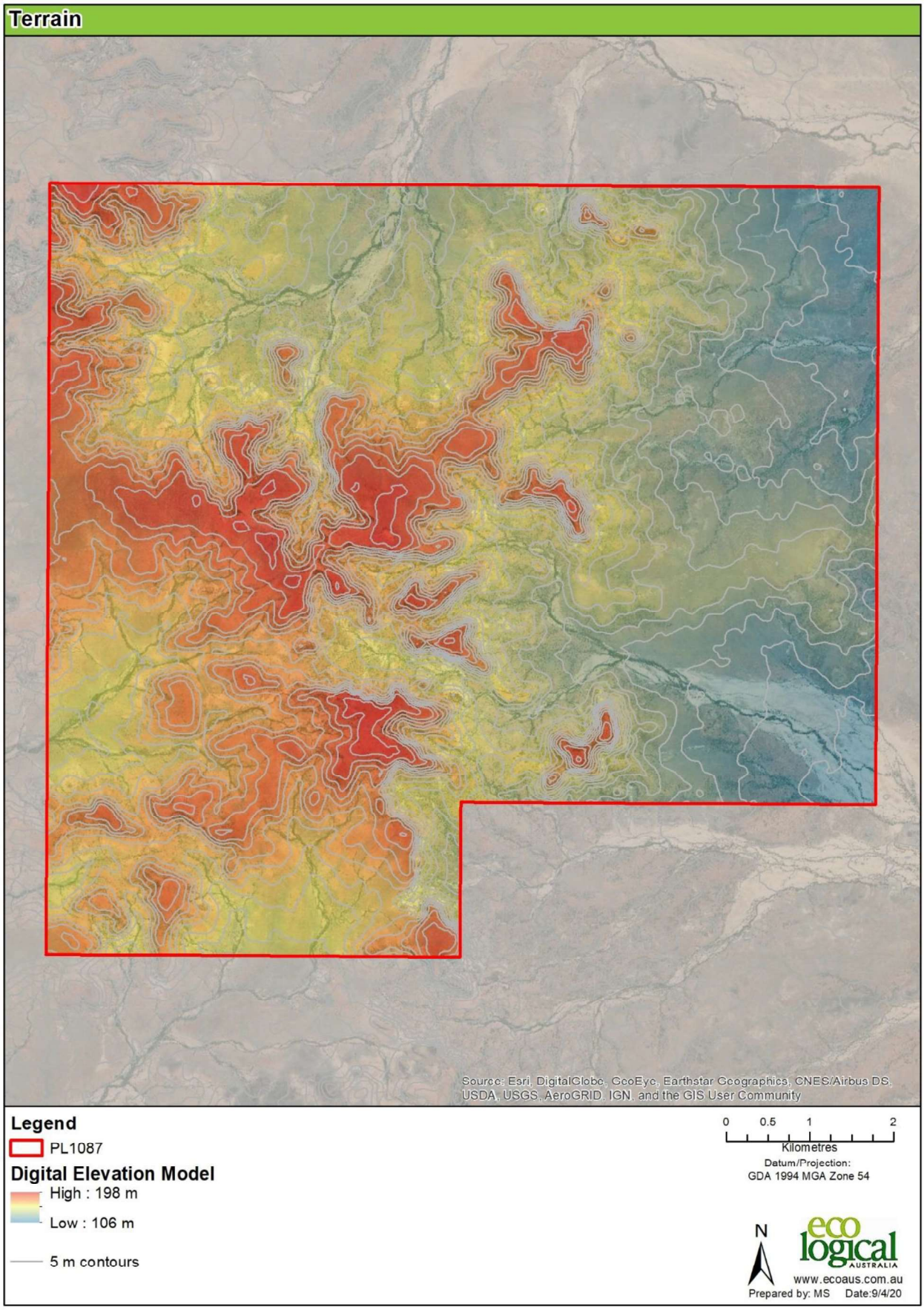

Figure 2: Terrain

Table 2: Likelihood assessment criteria of occurrence within study area

Likelihood	Definition
Known	The species has been recorded within the study area.
Likely	The study area is within the species' known distribution, suitable good quality habitat occurs within the area and the species is known to occur within the region.
Potential	The study area is within the species' known distribution, marginal habitat occurs within the area and the species is known to occur within the region.
Unlikely	There is a low probability that the species will occur within the study area as it is outside the species known distribution, low quality habitat occurs within the area or the species is not known to occur within the region.

2.2 RE mapping

Regional Ecosystems (REs) are classified based on a three-part hierarchy (code) for each RE. Land is firstly classified by bioregion, then by land zone, then by vegetation. In some instances, a fourth part of the code is used to further the RE into separate vegetation communities. RE profiles identified in the study area are provided in **Appendix B**.

Bioregions have been mapped at a national scale (1:2,500,000) and the relevant bioregion is identified by querying national databases. Land zones represent major differences in geology, associated landforms, soils, and physical processes that produced, or continue to drive them (Wilson and Taylor 2012). Land zones are typically mapped at a regional level (1:100,000). The vegetation component of a RE is a plant association where the dominant layer has a relatively uniform floristic composition and structure and are also typically mapped at a regional level.

Land zone mapping was undertaken using a combination of high-resolution imagery, geological mapping, the DEM and state-wide RE mapping. Plant association mapping was undertaken using an on-screen digitising approach in ArcGIS 10.7.1 at a scale of between 1:2,500 and 1:10,000. Spatial data were loaded into the GIS and RDPs were combined with BioCondition plots to form a combined dataset which was overlain on the high resolution (20 cm) imagery.

RDPs and BioCondition plots were used as an initial guide to identify REs. Aerial Photographic Interpretation (API) was then used to generate linework based on distinct patterns in the imagery representing vegetation community boundaries with the most appropriate community attributed.

A number of rules were developed prior to the commencement of mapping:

- The minimum polygon size is 0.01 ha (e.g. 10 m x 10 m)
- The minimum polygon width is 10 m
- Avoid or minimise heterogenous (multiple unit/mosaic) polygons
- Non-native vegetation is excluded.

RE map units were attributed in accordance with the Queensland Herbarium labelling convention and for consistency against the Santos Spatial Data Structures (Santos 2019). This convention is based on the dominant flora species of the ecologically dominant layer, the vegetation structure and the relevant landscape position (e.g. *Astrebla* spp. +/- short grasses +/- forbs open herbland on Cretaceous sediments). Occasionally soils are also included in a name to assist with further differentiation, such as where an RE included a broad range of vegetation communities.

Each polygon was assigned the following attributes:

- Mapped RE Code
- Mapped RE Short Description
- Mapped RE Queensland *Vegetation Management Act 1999* (VMA) Class
- Mapped RE Biodiversity Status
- Landcover
  - cn = non-woody vegetation (e.g. grasslands, herblands etc.) without cultivation patterns. Woody component <5%
  - cl = non-woody areas with cultivation patterns. Woody component <5%
  - ch = Bare earth (scalds, salt scald, bare fallow). Total vegetation cover <5%
  - g = Woody vegetation (e.g. woodlands, shrublands, forest etc.)
  - k = wetlands (natural) both woody and non-woody
  - f = artificial water storage and natural open water. E.g. lakes, dams, weirs, turkey nest dams
  - w = rock outcrop (w1=<20%, w2=20-50%, w3=50-70%, w4=>70%)
  - a = agricultural land cover (e.g. cropping, exotic pasture, horticulture, plantation)
  - e = non-natural landcover (e.g. mining, quarrying, urban, roads, utilities)
- Vegetation cover
  - Dominant stratum cover (classes:<0.1%; >0.
  - 1–5%; >5–10%; >10–20%; >20–50%; >50–80%; >80%)
  - Additional woody cover (includes emergents – isolated individuals)
  - Total non-woody cover % (ground cover) in addition to the above.
  - Life forms
  - Growth form of dominant stratum (e.g. tree, tree mallee, shrub etc.)
  - Dominant ground cover type (grassy, dry scrub, wet heath, mesic, intermediate)
- Confidence:
  - **1** Polygon visited. Remotely observed signature is distinct and will not be confused with other pattern types, no unfamiliar or unexplained elements, relationship between pattern type or predicted species composition and landscape not an issue
  - **2** Polygon not visited. Remotely observed signature is distinct and will not be confused with other signatures, no unfamiliar or unexplained elements, relationship between pattern type or predicted species composition and landscape not an issue
  - **3** Polygon not visited. Remotely observed signature is reasonably good, some chance of mistyping, any unfamiliar elements are minor, may be some level of doubt regarding predicted species, vegetation type or pattern type and landforms
  - **4** Polygon not visited. Remotely observed signature is very similar to other signature/s and may have been mistyped, polygon contains unfamiliar or unexplained elements, polygon pattern, vegetation type or predicted species at odds with other remotely sensed elements
- Photo pattern classification - a unique descriptor defining visual texture and colour. A total of 64 separate units were defined.

The final mapped product is considered accurate at a 1:10,000 scale. Supplementary datasets such as the DEM were used to help inform the API and to delineate boundaries between vegetation communities. The fine scale nature of the available imagery and the features of mapping supported by a DEM allowed for the accurate identification of REs across the landscape based on landscape position, visual signature (texture, pattern and colour) and structure.

2.3 Field survey

The field survey for this project was undertaken over three days from 18 to 20 January 2020 by ELA Principal Botanist Martin Sullivan and Senior Ecologist Matthew Dowle. The survey was conducted to

collect additional information on the relevant ecological values identified in the desktop assessment, including RE field validation and BioCondition Assessments (**Appendix C**).

2.3.1 RE field validation

Sixty-eight RDPs were surveyed as part of this project and are shown in **Figure 3**. Sites were stratified across the landscape and aimed to sample all photo patterns identified during RE mapping ensuring all REs present were identified, and also to ensure variations in condition were captured.

RDPs were used to verify vegetation to aid API. At each RDP the dominant canopy, midstorey and groundcover species; structural cover condition; vegetation structure; RE; environmental weed species and cover; threatened species and count; soil texture; evidence of fire; vegetation condition; landform element and pattern; notes; photo number; surveyor, and date were recorded. RDPs are less comprehensive than full floristic vegetation plots, however they allow for rapid identification of wetland types which could then be interpreted through API. RDPs are equivalent to 'quaternary' sites as described by Neldner et. al. (2019).

Vegetation surveys were undertaken in the field using mobile devices loaded with Collector for ArcGIS software and relevant Geographic Information System (GIS) datasets (aerial photography, draft RE mapping, contours, drainage and existing infrastructure).

2.3.2 BioCondition assessment

BioCondition is a condition assessment framework developed specifically for vegetation in Queensland that quantitatively evaluates vegetation condition through a quantitative assessment of biodiversity through composition (floristic diversity), structure, and function (Eyre et al. 2015). Condition of a particular patch of vegetation is defined by the degree to which the measured attributes match those from the same vegetation in its reference state.

The primary components of BioCondition include the assessment unit, a suite of vegetation condition attributes (surrogates or indicators of biodiversity values), benchmarks for each attribute for each RE, an assessment method and a scoring system that provides a final condition score.

For the purposes of this project and in consideration of the arid landscape in which the study area is located, a customised BioCondition assessment tool was developed in Survey 123 for ArcGIS. The assessment tool allows trained observers to rapidly assess the condition of an assessment unit (relatively homogenous areas of a particular RE in a broad condition state) in accordance with the principles of the BioCondition Assessment Framework by evaluating the composition, structure and functional components against benchmarks using a range of values, rather than absolutes. It is noted that these rapid BioCondition plots do not fully meet the prescribed BioCondition method, and should offsets be required, additional formal BioCondition plots may be required.

The customised BioCondition assessment tool includes consideration of site-based attributes including:

- Tree, shrub, grass & grass like, forb and other richness (diversity)
- Non-native plant cover
- Tree canopy height
- Tree, shrub and native perennial grass cover
- Number of large trees (eucalypt and non-eucalypt)
- Litter cover
- Length of fallen logs
- Proportion of ecologically dominant canopy species with evidence of recruitment.

In addition, the customised BioCondition assessment tool included recording of spatial coordinates, site photographs, RE, vegetation structure, landform element and pattern, a qualitative vegetation condition assessment, general notes and management issues, as well as a floristic classification.

A total of 54 BioCondition sites were surveyed across the study area, with at least one and up to eleven sites surveyed in each RE to capture variation in floristics, structure and condition (**Figure 3**, **Appendix B**).

2.3.3 Unmanned aerial vehicle survey

An unmanned aerial vehicle (UAV) survey, commonly referred to as a 'drone' was utilised to enhance the accuracy of RE mapping. A DJI Mavic Air was flown by a registered operator in accordance with the Civil Aviation Safety Authority (CASA) standard operating conditions. The drone was used in the following manner:

- Approximately 30 high quality (4K) videos were flown in three flights across the study area. The video transects allowed for post flight analysis of dominant canopy species, vegetation structure, condition and transitions between communities. One flight was specifically undertaken to target a potential cave visually identified on an adjacent ridge.
- Over 130 high resolution photographs were taken across the study area. Aerial photographs captured allowed for post flight analysis of dominant canopy species, vegetation structure, condition and interpretation of cover of various vegetation communities. Aerial photographs were captured at a variety of angles including oblique and top-down to provide additional information not available in existing aerial photography.

While drones have been previously utilised in vegetation mapping projects, they typically have been used to create high resolution aerial photography mosaics, DEMS or spectral imagery. The use of a drone to support vegetation mapping in the manner undertaken for this project is relatively novel and has allowed far greater coverage of the study area than possible using traditional means (on foot).

Figure 3 shows the locations of all aerial transects surveyed in the study are to help inform RE mapping. Spatially referenced videos and photographs allow for rapid viewing of visual information to inform vegetation mapping in a particular area. **Plate 1** provides an example image used to inform RE mapping across the landscape and **Plate 2** provides an example of remote cave inspections.

Plate 1: Drone perspective of the eastern half of the study area showing the mosaic of vegetation types on flats, slopes and drainage lines

Plate 2: Cave inspection

2.3.4 Habitat assessments

General habitat assessments were conducted for threatened fauna species identified in the desktop assessment as having a potential or considered likely to occur within the study area (**Appendix A**).

Habitat assessments were undertaken qualitatively in conjunction with the RE field validation and BioCondition assessments (**Figure 3**) to quantify the presence and extent of potential threatened species habitat within the study area. A total of 56 habitat assessments were completed (**Figure 4**).

Considerations of habitat assessments were both species specific and generic, and included identifying the presence of key values such as, but not limited to; habitat condition (i.e. remnant or regrowth), groundcover composition, REs, soil type, presence of water or alluvial habitats and occurrence of species-specific habitat features.

2.3.5 Nocturnal surveys

A nocturnal (spotlighting) survey was conducted on 19 January 2020 in areas identified as potential habitat for species listed as MSES or MNES under Queensland or Federal legislation (**Figure 4**). The surveys included driving transects across grassland covered rocky (gibber) plains, totalling 3 hours of survey effort (two people for 1.5 hours).

2.3.6 Remote cameras

Four remote cameras were set up across the site for two nights on the 18 and 19 January 2020, totalling eight trap nights (**Figure 4**). The cameras were set up on the edge of karst / open caves targeting areas of high faunal activity, as determined by suitable tracks, scats and bone deposits (**Plate 3**).

Plate 3: Remote camera setup in karst / open cave targeting areas of high faunal activity

2.3.7 Opportunistic observations

Opportunistic observations of fauna, and/or fauna signs, such as tracks, scats and diggings were also recorded throughout the field surveys.

2.3.8 Limitations

- Vegetation condition was lower than what would be observed during better seasonal conditions due to the general absence of forbs other ephemeral/annual species. As key measures informing condition, a reduction in both diversity (composition) and cover

(structure) as a result of drought conditions has a direct impact on overall vegetation condition. These conditions are a natural part of the boom/bust cycle of arid environments and have been considered as part of the detailed impact assessment.

- The lack of fertile plant material (i.e. flowers and fruit) made the identification of plant species problematic. Plants have been assigned to a species wherever possible, and where not possible to a genus or family.
- There are relatively few records of threatened species within 100 km of the study area, however this is more likely a result of a lack of survey effort rather than an indication of lack of threatened species. Surveys in more optimal seasonal conditions would be required to confidently identify the majority of ephemeral species (including potential threatened species).
- Fauna populations (including threatened fauna) are considered to be currently much lower than what would be observed during more favourable seasonal conditions. These conditions are also a natural part of the boom/bust cycle of arid environments and have been considered as part of the detailed impact assessment.

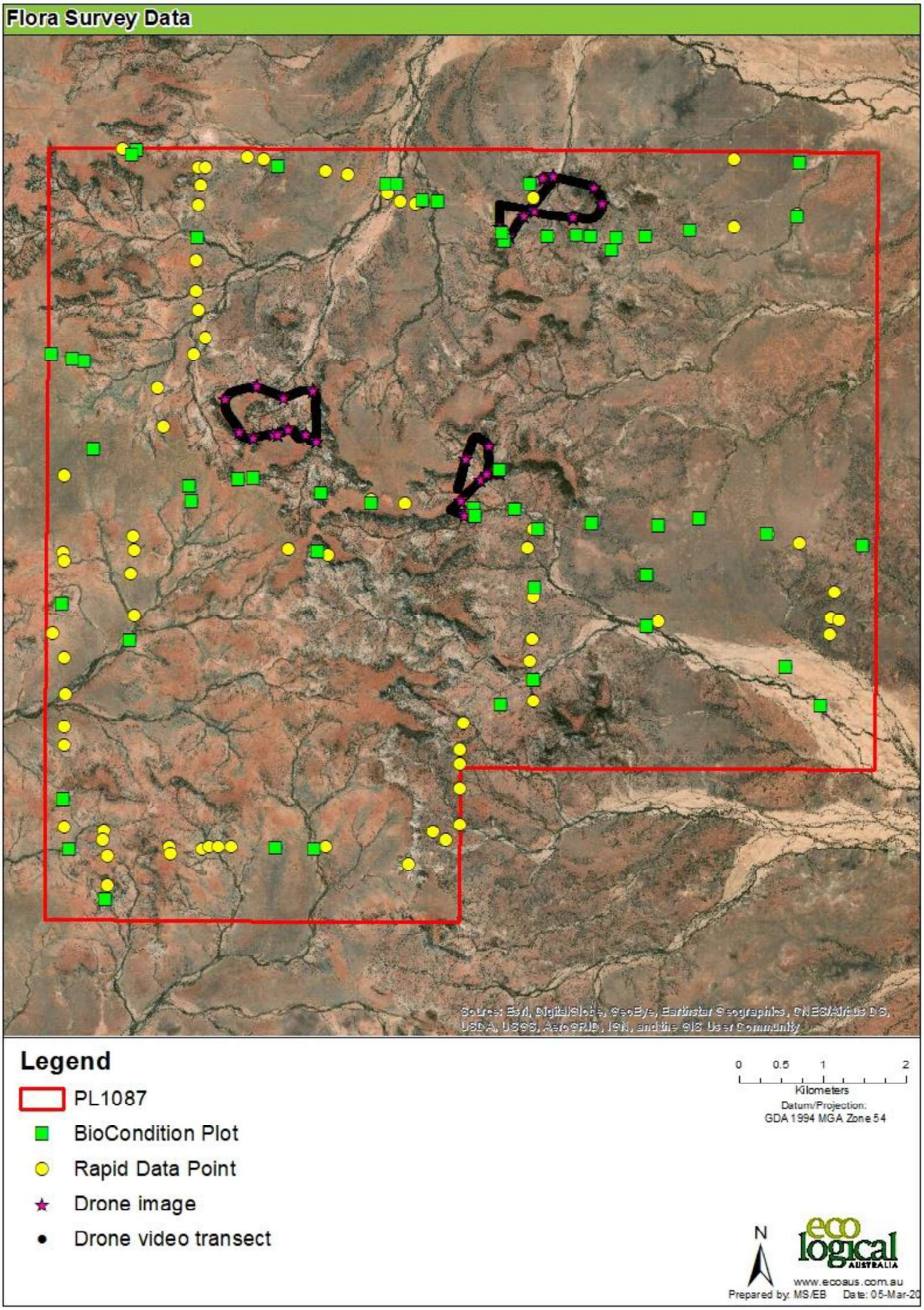

Figure 3: Flora survey sites within the study area

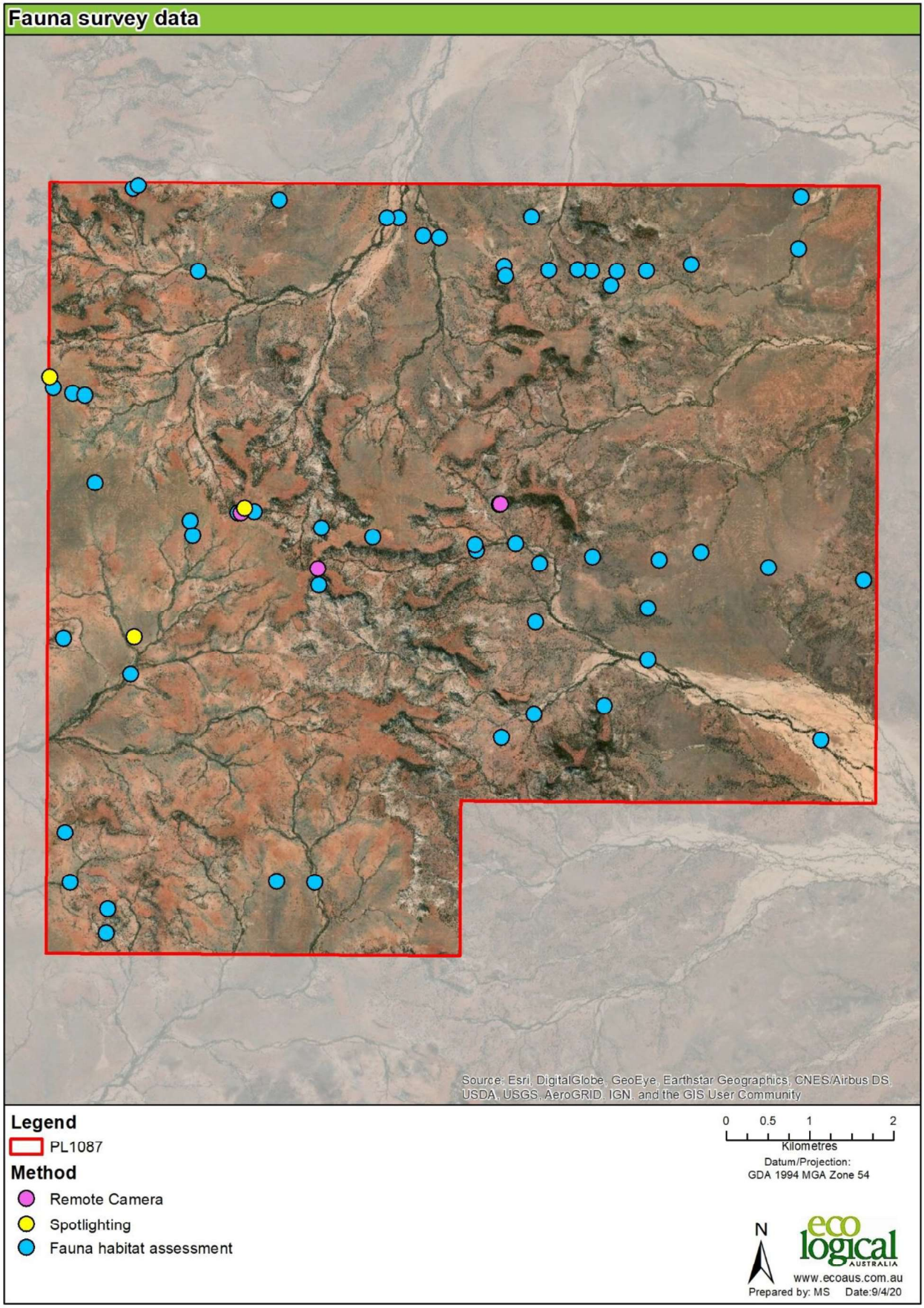

Figure 4: Fauna survey sites

3. Results

3.1 Survey conditions

Weather conditions leading up to and at the time of the survey are presented in **Table 3**. Weather data was obtained from recordings at Ballera Airport, located approximately 40 km south of the study area.

Table 3: Weather conditions preceding and during the field survey

Date	Temperature (° C)		Total rainfall (mm)	Max wind speed (km/h)
	Minimum	Maximum		
October 2019	17.7	32.9	12.6	78
November 2019	20.1	35.6	2.2	78
December 2019	25.9	41.1	0	63
15 January 2020	28.5	43.3	0.0	57
16 January 2020	27.6	40.8	0.0	78
17 January 2020	24.5	38.0	0.2	39
18 January 2020	23.6	38.9	0.0	39
19 January 2020	25.5	38.7	0.0	52
20 January 2020	23.3	33.8	0.0	57

3.2 Floristic diversity

A total of 61 flora species were identified as part of this project (**Appendix D**). The greatest diversity was recorded in the family Poaceae (14 species), with Chenopodiaceae (11 species), Fabaceae (Mimosoideae) (7 species), Fabaceae (Caesalpinioideae) (3 species), Myoporaceae (3 species), and Myrtaceae (3 species) also recorded.

3.2.1 Threatened flora species

Following the desktop assessment and field survey, one threatened flora species was considered to have the potential occur within the study area; *Indigofera oxyrachis* – although it was not observed during the field surveys. *I. oxyrachis* is a shrub listed as vulnerable on the NC Act. Little is known about the species, but ALA records exist to the north east of the project area on the eastern side of Cooper Creek (ALA, 2019). Queensland herbarium identifies specimens being recorded on stony rises on cracking clay soils and in open areas amongst low gidgee woodland, with *Senna artemisioides* and *Senna phyllodinea* present. It has also been recorded on open scalded creek flats at the base of escarpments, in open mixed woodland on light clay and sandy creek lines throughout stony patches. These types of habitats are widespread in the region, but the occurrence of *I. oxyrachis* is not.

3.3 Regional Ecosystems

A total of ten REs were ground-truthed in the study area (**Table 4**, **Figure 5**). Each RE was given a community/variant name to better represent the vegetation present in the study area compared to the state-wide classification. All of the REs mapped are classified as 'least concern' under the VMA and have a biodiversity status of 'No concern at present'. Condition of REs overall was considered in moderate to very high condition despite the ongoing drought conditions experienced at the time of survey. A large fire was observed to have moved through the entire landscape in the south-west of the study area in the years preceding the survey, resulting in widespread canopy death. Regeneration of canopy, shrub

and ground layers was observed to be occurring in fire affected areas and these are expected to recover over a long timeframe due to the arid environment and likely slow growth rates for large trees and shrubs.

Table 4: Ground-truthed Regional ecosystems and communities

RE	Short Description	Community / Variant	Class	Status	Structure	Area (ha)	Proportion of total
5.3.21a	Variable sparse to open herbland, Senna spp. open shrubland and bare scalded areas on infrequently flooded alluvia of major rivers their distributaries, drainage channels and creeks	Open herbland on alluvial flats	Least concern	No concern at present	Sparse	187.1	2%
5.3.4	*Eucalyptus camaldulensis* +/- *Acacia aneura* +/- *Acacia cambagei* +/- *Acacia georginae* +/- *Acacia cyperophylla* woodland on drainage lines within ranges	Miniritchie, River Red Gum, Coolabah and Gidgee woodland on larger drainage lines	Least concern	No concern at present	Sparse	290.0	4%
5.7.1	*Acacia shirleyi* +/- *Acacia catenulata* +/- *Acacia aneura* +/- *Acacia cyperophylla* var. *cyperophylla* low woodland on scarps and crests of residuals	Mulga on crests and upper slopes of dissected tablelands	Least concern	No concern at present	Sparse	1,844.2	22%
5.7.13	*Acacia cyperophylla* var. *cyperophylla* +/- *Acacia cambagei* or *Acacia georginae* +/- *Atalaya hemiglauca* tall shrubland on drainage lines	Miniritchie shrubland on minor drainage lines	Least concern	No concern at present	Sparse	582.5	7%
5.7.5	*Acacia sibirica* open shrubland +/- *Acacia aneura* +/- *Acacia shirleyi* +/- *Triodia* spp. open shrubland on crests and tops of dissected tablelands and ranges	*Acacia sibirica* shrubland on the crests of dissected tablelands	Least concern	No concern at present	Very sparse	475.7	6%
5.7.6	*Acacia cambagei* tall shrubland +/- *Triodia* spp. +/- *Senna* spp. on scarp footslopes and eroding pediments	Gidgee on mid to lower slopes of dissected tablelands	Least concern	No concern at present	Sparse	929.4	11%
5.9.1	*Senna* spp., *Eremophila* spp. +/- *Acacia* spp. +/- *Maireana* spp. open shrublands on fresh Cretaceous sediments and Cretaceous or Tertiary limestones	Senna shrublands on flat and gently undulating stony plains	Least concern	No concern at present	Very sparse	649.5	8%
5.9.2x1	*Senna artemisioides* subsp. *helmsii* +/- *Senna artemisioides* subsp. *oligophylla* +/- *Acacia georginae* +/- *Acacia* spp. open shrubland on Cambrian limestone	Gidgee woodland on flat and gently undulating stony plains	Least concern	No concern at present	Very sparse	1,139.4	14%

RE	Short Description	Community / Variant	Class	Status	Structure	Area (ha)	Proportion of total
	5.9.2x1: *Acacia cambagei* predominates and forms a distinct but discontinuous canopy						
5.9.3	*Astrebla* spp. +/- short grasses +/- forbs open herbland on Cretaceous sediments	Barely Mitchell Grass grassland/herbland on flat and gently undulating stony plains	Least concern	No concern at present	Sparse	1,700.7	21%
5.9.5	*Atriplex* spp. and/or *Sclerolaena* spp. and/or *Salsola australis* open herbland on Cretaceous sediments	Open herbland on flat and gently undulating stony plains	Least concern	No concern at present	Sparse	410.5	5%
-	Cleared					26.3	0.3%
Total						**8,235**	

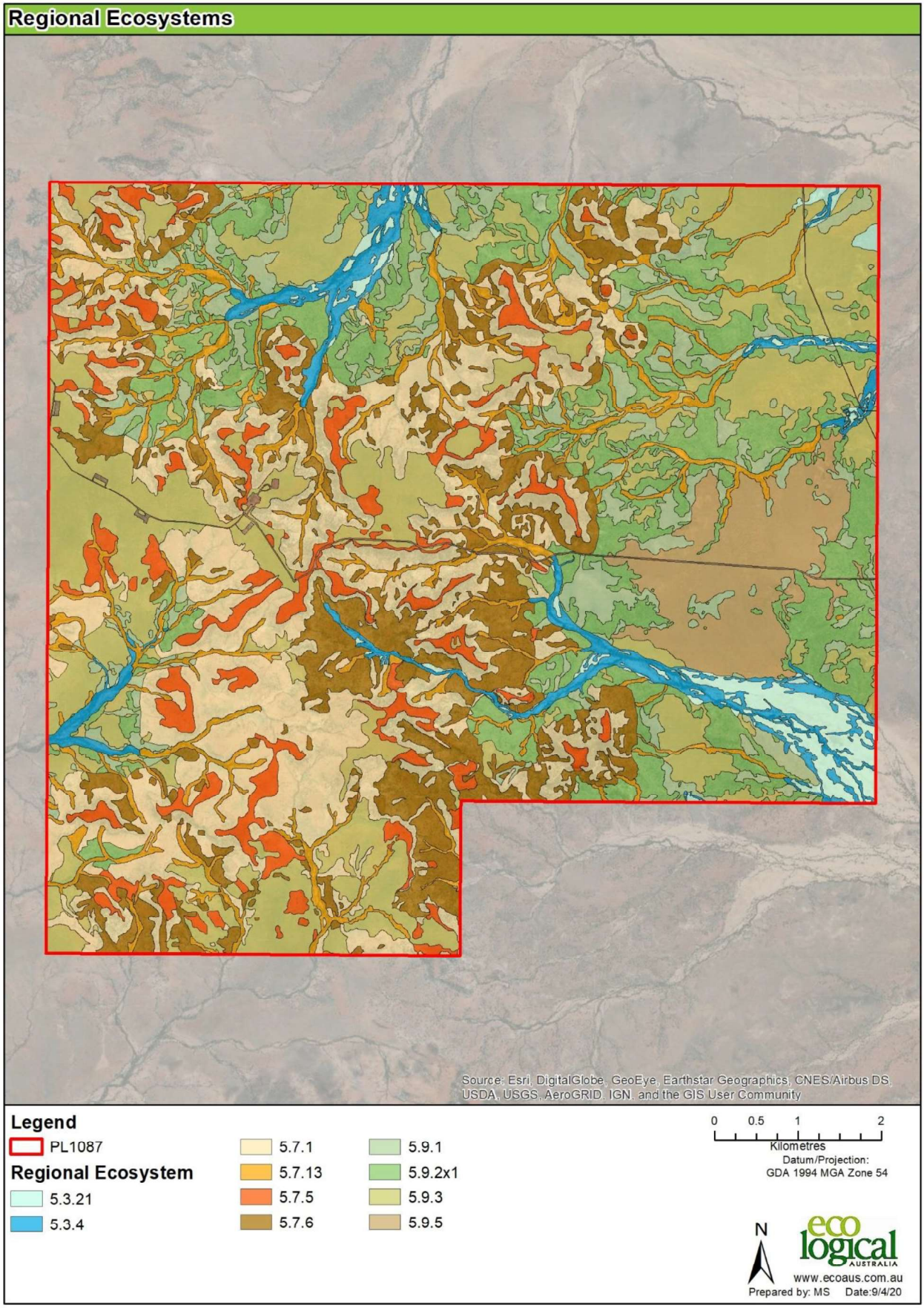

Figure 5: Ground-truthed REs in the study area

3.4 Habitat values

3.4.1 Fauna habitat types

A total of five broad habitat types were identified within the study area (**Table 5; Figure 6**). These habitats provide a range of resources for native fauna species, including threatened species. The habitat types within the study area were assessed with RE validation and may be represented by a single or multiple REs, and REs may overlap between habitat types.

Table 5: Fauna habitat types

Habitat type	Associated REs	Area (ha)	Threatened species considered as having a potential to occur
Gidgee shrubland	5.7.6, 5.9.2x1	2,069	Major Mitchell's Cockatoo, Grey Falcon, Woma
Low woodlands to tall shrublands dominated by *Acacia* species	5.3.4, 5.7.13	873	Major Mitchell's Cockatoo, Grey Falcon, Woma, Painted Honeyeater
Open shrublands dominated by *Senna* species	5.9.1	650	Grey Falcon
Mixed open herblands to open to tussock open grasslands in inland locations	5.3.21a, 5.9.3, 5.9.5	2,298	Grey Falcon
Mulga woodland	5.7.1, 5.7.5	2,320	Major Mitchell's Cockatoo, Grey Falcon, Woma
Caves[#]	5.7.1, 5.7.5		None

#Determined using DEM and occur as micro-habitat feature components of the other habitat types

3.4.1.1 Gidgee shrubland

This habitat type occurs on lower to mid slopes of dissected tablelands as well as the gently undulating stony plains. *Acacia cambagei* (Gidgee) is the dominant tree. A sparse to open shrub layer is often present with *Enchylaena tomentosa*, *Eremophila* and *Senna* species. This habitat type includes many large trees > 20 cm diameter at breast height (DBH) which provide foraging resources, coarse woody debris which provides perching and foraging habitat, as well as stony areas which provide refuge and sunning areas for reptiles. When in flower/fruit, the shrub layer is also likely to provide an important foraging resource. Threatened species considered as having a potential to occur within the study area may be associated with this habitat type include Major Mitchell's Cockatoo, Grey Falcon and Woma.

3.4.1.2 Low woodlands to tall shrublands dominated by Acacia species

The canopy of these woodlands are generally dominated by *Acacia cyperophylla* var. *cyperophylla* (Miniritchie) with *Eucalyptus camaldulensis* subsp. *arida* (River Red Gum) in areas which hold water for greater periods, and *Eucalyptus coolabah* (Coolabah) on the banks of larger drainage lines in the north and south-east of the study area. Gidgee is also a common component of this habitat type. A sparse to open shrub layer is often present with a very sparse ground layer. This habitat type includes many large trees > 20 cm DBH which provide foraging resources and coarse woody debris which provides perching and foraging habitat. Eucalypts in drainage lines are likely to provide a significant foraging resource for birds when in blossom. When in flower/fruit, the shrub layer is also likely to provide an important

foraging resource. Threatened species considered as having a potential to occur within the study area may be associated with this habitat type include Major Mitchell's Cockatoo, Grey Falcon, Painted Honeyeater and Woma.

3.4.1.3 Open shrublands dominated by Senna species

This habitat type occurs on flat to gently undulating tabletops and stony plains. *Senna artemisioides* dominates the sparse shrub canopy. Other shrub species may include *Acacia cambagei* (Gidgee) and *Acacia tetragonophylla* (Dead finish) and *Eremophila latrobei* (Crimson turkey bush) or other *Eremophila* species. Occasional low trees may occur including *Atalaya hemiglauca* (Whitewood). The ground layer is typically dominated by *Sclerolaena* (Copperburrs) species or sparse tussock grasses such as *Aristida contorta* (Kerosene grass). This habitat type typically does not contain any trees or coarse woody debris, limiting habitat suitability for many species. Shrubs provide perching and foraging resources, while the generally rocky substrate provides refuge and sunning habitat for reptiles. Threatened species considered as having a potential be associated with this habitat type include the Grey Falcon.

3.4.1.4 Mixed open herblands to open to tussock open grasslands in inland locations

Represented by Barley Mitchell Grass (*Astrebla pectinata*) and mixed herblands on gently undulating stony plains and open herblands/forblands on alluvial plains or gently undulating plains which can appear virtually devoid of vegetation. The dominant plants can vary depending on seasonal conditions and local variations in habitat. This habitat type typically does not contain any trees, shrubs or coarse woody debris, limiting habitat suitability for many species. The generally rocky substrate provides refuge and sunning habitat for reptiles and in better seasonal conditions the herblands and open grasslands would provide foraging habitat for a range of common species. Threatened species considered as having a potential to occur within the study area and may be associated with this habitat type include the Grey Falcon.

3.4.1.5 Mulga woodland

This habitat type is represented by *Acacia aneura* (Mulga) low woodlands or open woodlands. It occurs within the study area on the upper slopes and crests of dissected tablelands. Mulga vegetation is generally dominated by Mulga but can occur with other *Acacia* species and various other arid shrubs and trees. This habitat type typically does not contain any trees or coarse woody debris, limiting habitat suitability for many species. Shrubs provide perching and foraging resources, while the generally rocky substrate provides refuge and sunning habitat for reptiles. When in flower/fruit, the shrub layer is also likely to provide an important foraging resource. Threatened species considered as having a potential to occur within the study area and maybe associated with this habitat type include Major Mitchell's Cockatoo, Grey Falcon and Woma.

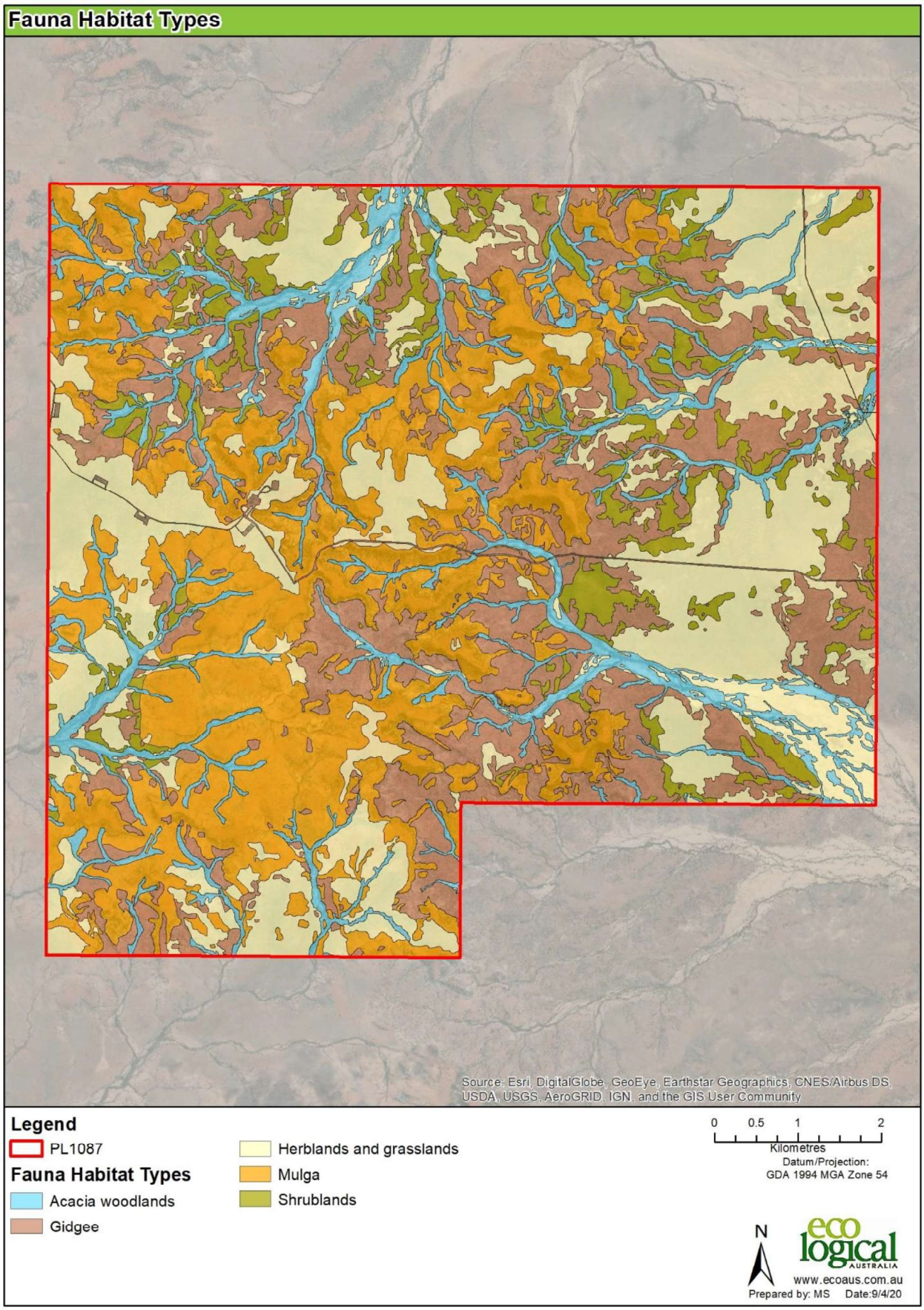

Figure 6: Fauna habitat types

3.4.1.6 Caves

Caves occur extensively in the study area along the perimeter of dissected tablelands where the softer layers under the silcrete duricrust have been weathered. Caves varied from shallow depressions and overhangs (rock shelters) to moderately deep to deep (>5 m) tunnels and fissures which are likely to have been formed as a result of both wind and water erosion over considerable time. A number of larger caves were inspected and were found to contain evidence of *Tyto javanica* (Barn Owl), unknown microbat species, macropods, small mammals and invertebrates (**Plate 4** to **Plate 9**). *Aquila audax* (Wedge-tailed Eagle) was captured on remote camera sheltering in one of the larger overhangs (**Plate 10**). Evidence of long-term occupation of Barn Owls in the form of solidified guano flows and bone/pellet deposits and microbats in the form of deep layers of guano and roof markings. Caves in the study area provide important breeding, roosting, foraging habitat and refuge habitat for a range of common and widespread fauna species.

To assist with the avoidance of cave habitat within the study area, a slope analysis was undertaken using the DEM to identify areas which have the potential to support caves. The resulting classification includes five categories: low, low-moderate, moderate, moderate-high and high based on relative slope (**Figure 7**). While there is potential to find caves in all categories (and also in other small areas not mapped), it is considered most likely to find caves in the moderate to high probability areas. Further interrogation of these areas using high-resolution aerial imagery can be undertaken to ascertain the likely presence of caves.

3.4.2 Fauna species

A list of fauna species identified from the remote cameras and spotlighting surveys, and recorded through opportunistic observations is provided in **Appendix E**.

Fauna populations were considered low at the time of survey with only seven mammals and 17 bird species being observed, or evidence of presence recorded. No reptiles were observed despite the large amount of suitable rocky habitat. The lack of reptile observations is considered likely due to the extensive drought and very hot summer conditions experienced during the survey.

While good remnant structural and refuge habitat was present in areas, the lack of flowering and seeding plants as well as permanent water sources is likely to have restricted the diversity and abundance of fauna population.

3.4.3 Essential habitat

Essential habitat for protected wildlife is defined under the VMA as a category A area (vegetation offset area), a category B area (remnant vegetation) or category C area (high-value regrowth vegetation) shown on the regulated vegetation management map:

1) That has at least three essential habitat factors for the protected wildlife that must include any essential habitat factors that are stated as mandatory for the protected wildlife in the essential habitat database; or
2) In which the protected wildlife, at any stage of its life cycle, is located.

The desktop assessment determined that there were no essential habitat mapped areas within the study area, and this was confirmed by the field surveys.

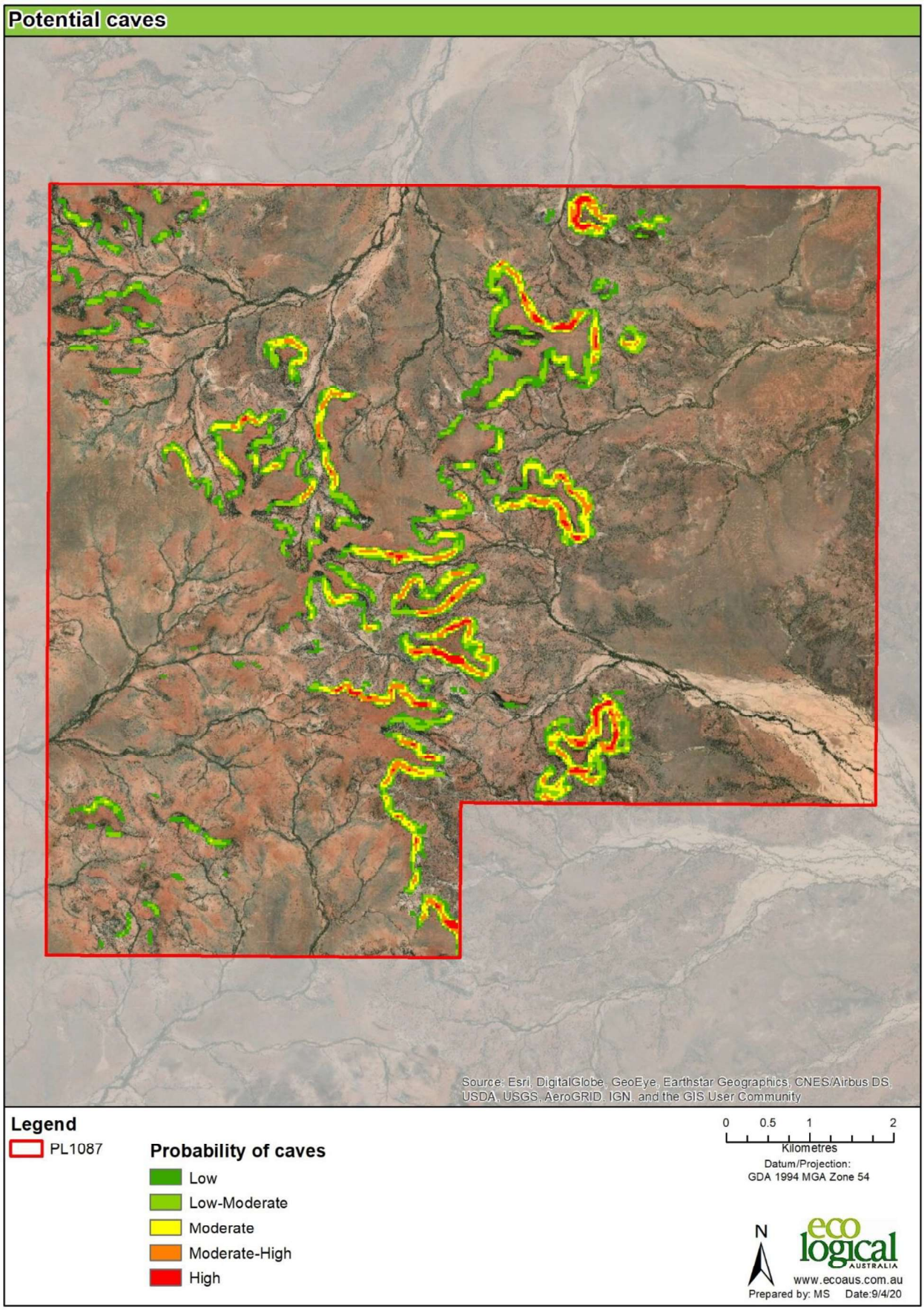

Figure 7: Probability of caves

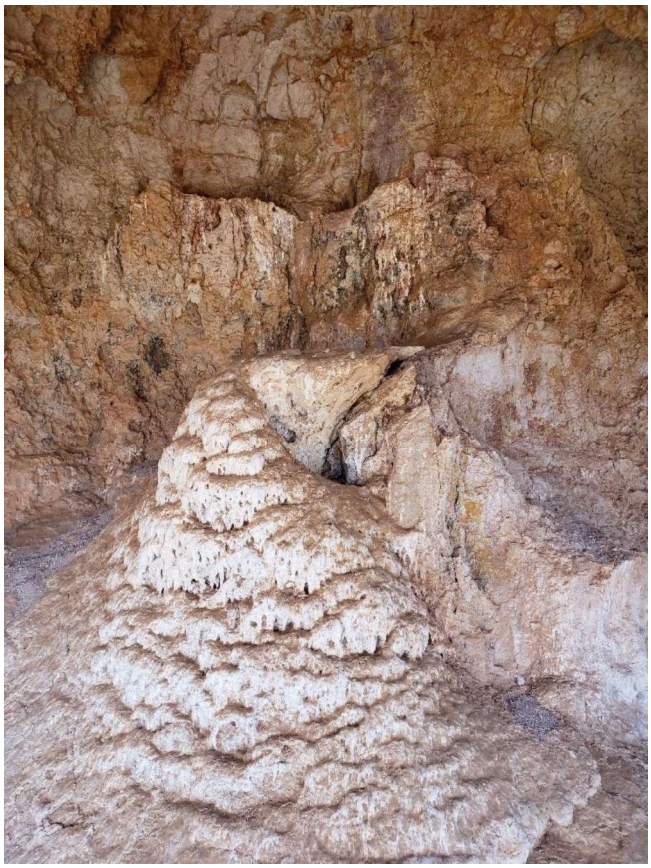

Plate 4: Solidified guano flow likely from Barn Owl and other raptors

Plate 5: Barn Owl pellets inside small cave within large rock shelter

Plate 6: Cave system within duricrust on the edge of dissected tablelands

Plate 7: Bone deposits below Barn Owl roost

Plate 8: Narrow entry to large microbat cave. Deep guano deposits cover the entry and floor of the cave

Plate 9: Evidence of roosting with stained ceilings and guano deposits deeper in the cave

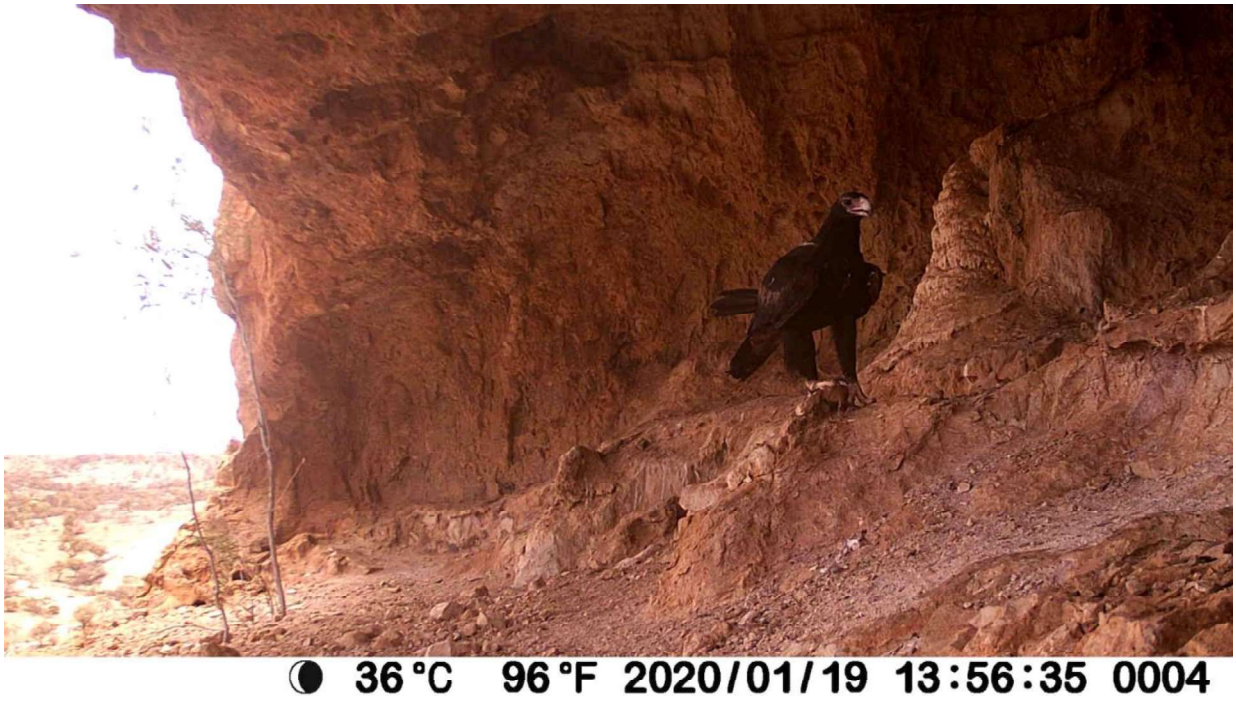

Plate 10: Wedge-tailed Eagle sheltering in rock overhang

3.4.4 Threatened fauna and migratory species habitat values

Following the desktop and field assessments, five Endangered, Vulnerable or Near Threatened (EVNT) or special least concern fauna species listed under the NC Act are considered as having potential to occur within the study area (**Appendix A**). These include NC Act Vulnerable listed birds Grey Falcon, Major Mitchell Cockatoo and Painted Honeyeater, NC Act Near Threatened listed reptile Woma, and Special Least Concern bird Fork-tailed Swift. Grey Falcon and Painted Honeyeater are also listed as Vulnerable under the EPBC Act, whilst Fork-tailed Swift is listed as migratory under the EPBC Act. No threatened fauna species were identified during field surveys.

Based on known distributions, the species' occurrence within the region and preferred habitat requirements, threatened and migratory species are considered to be unlikely or have a low potential to occur, due to the lack of high quality suitable habitat within the study area, or because the study area is outside the known range of the species. Furthermore, vegetation of Cooper Creek (13 km east of the study area) and its immediate tributaries with pooling water/drought refuge is likely to represent higher quality habitat for the threatened species considered in the likelihood of occurrence assessment (**Appendix A** and **Table 5**), due to permanent access to water and/or presence of significant riparian vegetation.

It should be noted that surveys for threatened species were limited to habitat assessments, remote camera surveys, spotlighting and opportunistic observations. No trapping surveys were undertaken which are required to confidently identify some threatened species. The combination of surveys undertaken as part of this assessment are considered appropriate for the detection of the target species.

3.5 Landscape values

3.5.1 Wetlands and watercourses

Both Regulated Vegetation – within 100m of a Vegetation Management Wetland and Regulated Vegetation – intersecting a watercourse are present within the study area (**Figure 8**).

A total of 403.94 ha of Regulated Vegetation – within 100m of a Vegetation Management Wetland is mapped within the study area.

The Vegetation Management Watercourse and Drainage Feature Map identifies 75.73 km of stream order (SO) 1, 24.52 km of SO 2 and 4.29 km of SO 3 as present in the study area which includes the westerly reaches of Cooper Creek. No ground-truthing of watercourses was conducted, rather the location of defining banks for Vegetation Management Watercourses was estimated by buffering the centre line of each of these SOs by 25 m on each side (this assumes a typical watercourse channel width of 50 m).

The maximum area of 'Regulated Vegetation - intersecting a watercourse' was estimated by buffering the above estimated channel width (50 m) obtained from the Vegetation Management Watercourse and Drainage Feature Map by the defined distance as per the Queensland Environmental Offsets Policy V1.9 (DES 2020), using SO as per the Vegetation Management Watercourse and Drainage Feature Map. Accordingly, 1,052.04 ha of SO 1 and 2 and 73.98 ha of SO 3 of MSES Regulated Vegetation – intersecting a watercourse is present.

3.5.2 Connectivity

The study area is representative of intact, remnant vegetation, with very little disturbance in context to the landscape. Therefore, for the purposes of the *Environmental Offsets Regulation 2014* (EO Reg), it is considered that all vegetation and habitats in the study area provide connectivity.

3.6 Discussion

At the time of survey, the study area was drought affected with a low diversity of native plant species present in the ground layer. Conditions were poor in ephemeral alluvial systems where annual forbs and grasses would form temporary swards following localised flooding. These areas are likely to respond dramatically following significant rainfall but largely persist as soil seedbanks during dry conditions which prevail for most of the year. It is important to note that the vegetation present in the study area is structurally sparse to very sparse with treeless grasslands, herblands/forblands accounting for nearly 50% and shrublands accounting for a further 36% of the total study area. This creates a significant opportunity for Santos to avoid and/or minimise impacts on more structurally diverse ecosystems and therefore reduce impacts on threatened species.

Fauna populations were considered low at the time of survey with only seven mammals, and 17 bird species being observed, or evidence of presence recorded. While structural habitat was present in areas, the lack of flowering and seeding plants as well as permanent water sources is likely to have restricted the diversity and abundance of fauna populations. This was particularly apparent with the observation of long-term evidence of Barn Owl and microbat occupation in a number of cave systems which were not occupied at the time of survey. It is considered likely that these species use the resources of the study area on a seasonal basis, avoiding the hottest months of the year.

Conservative assessments using expert opinion were utilised in site assessments to ensure vegetation condition was not underestimated. This is considered appropriate with the majority of the Channel Country Bioregion being 'remnant' and not subject to widespread land clearing. While some evidence of disturbance through grazing impacts and timber harvesting for fence construction was observed, the vegetation present in the study area is largely considered natural and in moderate to good condition, although drought affected.

BioCondition Benchmarks were available for all REs, however there are a number of limitations:

- Most benchmarks included a range of values, rather than an absolute value. In many cases the range also included '0' which means for many attributes despite condition, they are considered to be in 'benchmark'.
- Some benchmark attributes had 'no data' available, especially for functional attributes such as large trees and litter cover, making comparisons against benchmark difficult. Where benchmarks were not available for a particular attribute, it was weighted at benchmark.

While woodlands are measured against benchmark for all attributes recorded, shrublands and grasslands/herblands are only measured against a subset of values. The removal of functional attributes for these structural types and the absence of additional measures to determine condition results in artificially higher scores for shrubland and grassland/herbland ecosystems.

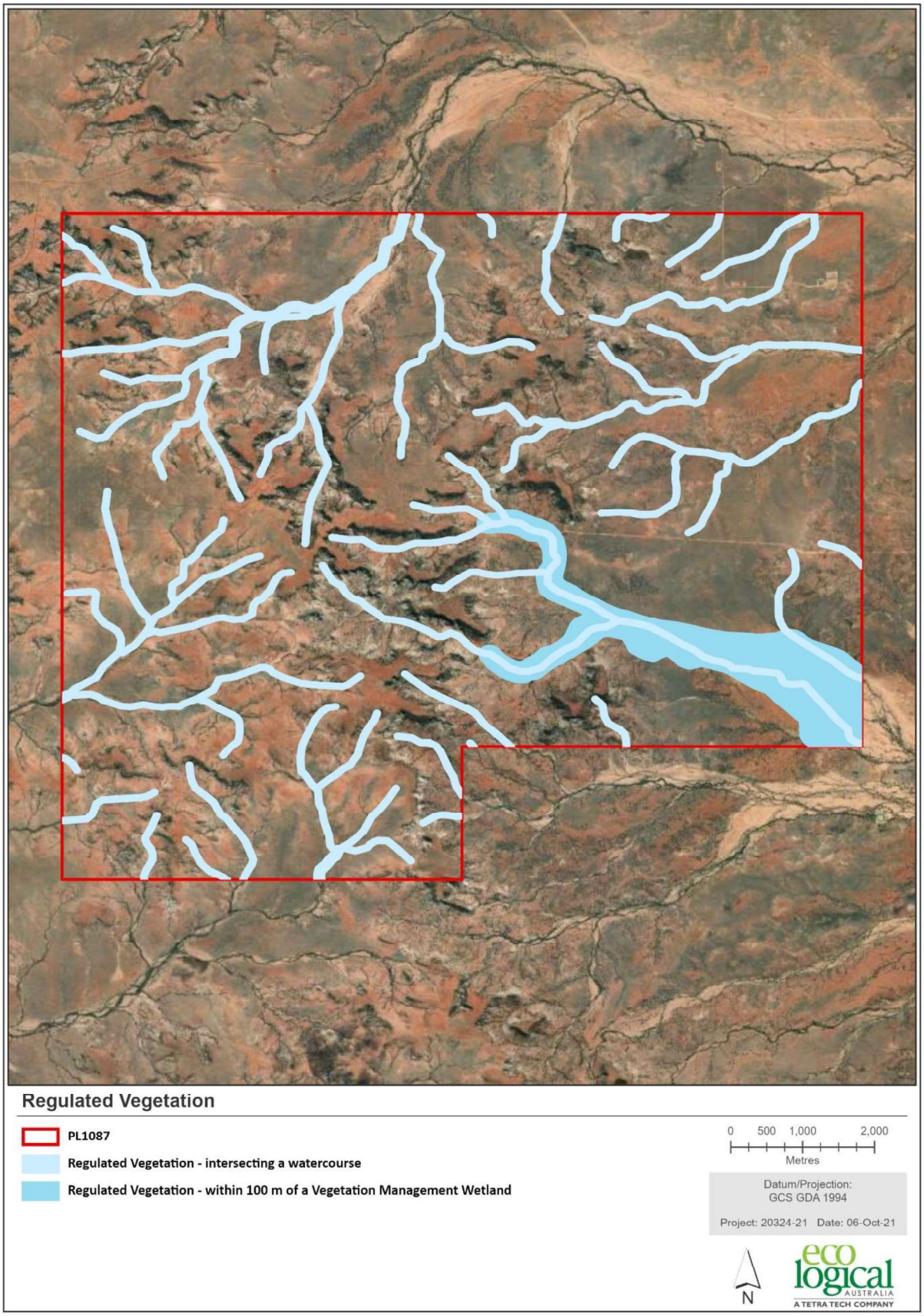

Figure 8: Regulated vegetation – intersecting a watercourse and 100 m of a Vegetation Management Wetland

4. Impact assessment

4.1 Overview

ELA understands that Santos are proposing to increase disturbance progressively within the study area by approximately 64 ha in total. The proposed disturbance is required for the construction of petroleum well leases and associated infrastructure including borrow pits, pipeline right of ways and access tracks.

Santos has some understanding of prospective areas within PL 1087 based on the findings of previous seismic survey and drilling results undertaken in the tenure. However, Santos does not yet know the precise location of proposed wells and associated infrastructure. Conventional petroleum activities typically involve drilling a small number of deep, precisely located wells targeting small-localised accumulations of hydrocarbons (unlike Coal Seam Gas (CSG) activities, which typically target a relatively shallow broad resource i.e. coal seams). Further, unlike CSG, the precise location of a proposed conventional oil or gas well is typically contingent on detailed assessment of the findings of previous nearby well drilling and seismic survey activities. Further, once the precise "bottom hole" (BH) location of a well is determined for geological purposes, the surface location may be subject to a range of restrictions and sensitivities, and the well lease (and supporting infrastructure) may need to be shifted to avoid these areas e.g. cultural heritage and environmental sensitivities. In some cases, the well bore may even be "deviated" to avoid surface sensitivities, but still target the BH location.

Therefore, the precise location of infrastructure in PL 1087 will be subject to the progressive development of the gas field within the study area over a 10-20 year timeframe and the proposed estimate of clearing is considered an upper limit.

The potential for impacts to MSES or MNES are limited. Potential habitat for the Grey Falcon, Major Mitchell's Cockatoo and Painted Honeyeater has been identified and an assessment of this impact on protected wildlife habitat MSES is provided below. No MNES are considered likely to be significantly impacted.

4.2 Significant increase in the risk of environmental harm

In accordance with the *Environmental Protection Act 1994* (EP Act), a resource activity is likely to lead to a significant increase in the risk of environmental harm if there are:

- Increasing impacts to Category A or B Ecologically Sensitive Areas (ESAs); and
- Increasing scale and nature of disturbances by a prescribed activity that will, or are likely to, result in a significance residual impact (SRI) on a prescribed environmental matter (listed in Schedule 1 and Schedule 2 of the EO Reg).

Based on range of development scenarios and the proportion of vegetation contained within prospective resource areas, upper disturbance limits for MSES have been determined (**Table 6**). This includes the development of areas that will be subject to temporary disturbance only (e.g. pipeline right of ways). The disturbance will occur within a range of REs all of which are classified as 'least concern' under the VMA and have a biodiversity status of 'No concern at present'. Therefore, there will be no impacts to Category A or B ESAs.

Potential habitat for the Grey Falcon, Major Mitchell's Cockatoo, Painted Honeyeater and *Indigofera oxyrachis* has been identified and an assessment of this impact on protected wildlife habitat MSES is provided below and the upper disturbance limits to these matters is provided in **Table 6**. Whilst

potential habitat for Near Threatened Woma is considered to occur, this is not considered an MSES under Schedule 2 of the OE Reg.

Table 6: Upper disturbance limits for MSES

MSES	Upper Disturbance Limit (ha)
Protected wildlife habitat (Grey Falcon, Major Mitchell's Cockatoo, Painted Honeyeater and *Inidgofera oxyrachis*)	64 ha
Total	**64 ha**

4.3 Matters of National Environmental Significance (MNES)

The EPBC Act establishes a process for assessing the environmental impact of activities and developments where 'Matters of National Environmental Significance' (MNES) may be affected. Under the EPBC Act any action which 'has, will have, or is likely to have a significant impact on a Matter of National Environmental Significance' is defined as a 'controlled action', and requires approval from the Commonwealth Department of Agriculture, Water and the Environment (DAWE) which is responsible for administering the EPBC Act.

Potential habitat for Vulnerable EPBC Act listed bird Grey Falcon and Painted Honeyeater has been identified and an assessment has been conducted against the outlined criteria in the MNES Significant Impact Guidelines 1.1 (DotE, 2013) and is provided in **Appendix F**. The upper disturbance limits to these matters is provided in **Table 7**.

Table 7: Upper disturbance limits for MNES

MNES	Upper Disturbance Limit (ha)
Listed threatened species – Grey Falcon and Painted Honeyeater	64 ha
Total	**64 ha**

Additionally, the Fork-tailed Swift is listed as migratory under the EPBC Act. It is a non-breeding migratory aerial only species, known to occur in all states and territories in Australia and is likely to fly over the study area on occasion. It is unlikely that this species will be impacted by the proposed expansion of operations in the study area (**Appendix A**).

4.4 Matters of State Environmental Significance (MSES)

MSES are a component of Queensland's biodiversity state interest that is defined under the State Planning Policy (SPP) and defined under the EO Reg. MSES includes certain environmental values that are protected under a number of pieces of Queensland legislation. The EP Act is the relevant instrument for this assessment.

A summary of MSES as defined on Schedule 2 of the EO Reg and their presence within the study area is provided in **Table 8** below.

Table 8: Matters of state environmental significance in the study area

MSES	Presence within the study area
Regulated vegetation – prescribed REs that: • are endangered REs • are of concern REs	Yes – it includes the following:

MSES	Presence within the study area
• intersect with an area shown as a wetland on a vegetation management wetland map • contain an area of essential habitat on an essential habitat map for endangered or vulnerable wildlife • are located within a defined distance of a relevant watercourse or drainage feature[1].	• 403.94 ha of an area shown as a wetland on the vegetation management wetlands map • 1,126.02 ha located within a defined distance of a watercourse
Connectivity areas	Yes – the vast majority of vegetation within the study area is considered to be intact, remnant vegetation and therefore represents connectivity areas. 8,235.35 ha of connectivity occurs.
Wetlands and watercourses	No
Designated precinct in a strategic environmental area	No
Protected wildlife habitat[2]	Yes – potential habitat for Grey Falcon, Major Mitchell's Cockatoo, Painted Honeyeater and *Indigofera oxyrachis*
Protected areas	No
Highly protected zones of State marine parks	No
Fish habitat areas	No
Waterway providing for fish passage	No
Marine plants	No
Legally secured offset areas	No

1As per Section 3.5.1.

2Does not include Near threatened wildlife

4.5 Regulated vegetation

The regulated vegetation present in the study area is that located within a defined distance of a relevant watercourse or drainage feature and those REs that intersect a mapped wetland. This includes a number of REs, all of which are in the 'sparse' to 'very sparse' structure category.

A portion of regulated vegetation intersecting a watercourse and regulated vegetation within 100m of a vegetation management wetland may be directly impacted through the clearing of vegetation for infrastructure for the proposed development.

4.5.1 Significant Residual Impact Guideline Clearing Limits – Regulated Vegetation

The SRI Guideline (EHP 2014) provides criteria for identifying when an impact to a MSES may be deemed to be significant. The SRI guideline contains tests and criteria that provide a trigger for when Environmental Offsets may be required.

The SRI Guideline provides test criteria for two MSES occurring within the PL, namely:

- Regulated vegetation:
  - within 100 m of a Vegetation Management Wetland; and
  - intersecting a watercourse.

Section 2.1 of the SRI Guideline states that for an SRI to occur for these MSES, proposed disturbance must exceed clearing area and width limits (**Table 9**), and clearing must occur within a specific distance of the 'defining bank' of the wetland or watercourse.

For the purposes of this SRI assessment, the following rules and assumptions have been applied:

For clearing in the portion of a regional ecosystem that lies within a mapped wetland:

1. Vegetation Management Wetlands are as per the Regulated Vegetation Management Map to the extent the regional ecosystem contains remnant vegetation.

2. The 'defining bank' of a VMA wetland is as per the map (i.e. the defining bank is the mapped polygon edge of the wetland).

For clearing in a regional ecosystem that is within the defined distance of a watercourse:

1. Vegetation Management Watercourses are as per the Vegetation Management Watercourse and Drainage Feature Map (as per Section 20AA of the VMA) to the extent the regional RE contains remnant vegetation.

2. Defined distance from the defining banks of Vegetation Management Watercourses is as per the Queensland Environmental Offsets Policy V1.10 (DES 2020) using stream order as per the Vegetation Management Watercourse and Drainage Feature Map.

3. The location of defining banks for Vegetation Management Watercourses was estimated by buffering the centreline of Vegetation Management Watercourses by 25 m on each side (i.e. this assumes a typical watercourse channel width of 50 m).

The maximum area of regulated vegetation - intersecting a watercourse was estimated by buffering the Vegetation Management Watercourse and Drainage Feature Map by the defined distance as per the Queensland Environmental Offsets Policy V1.10 (DES 2021), using stream order as per the Vegetation Management Watercourse and Drainage Feature Map. The maximum area of regulated vegetation - intersecting a watercourse includes

a) the defined distance, and
b) the average channel width area as described at point 3 above.

Other MNES and MSES do not have prescribed clearing area test criteria within the SRI Guideline (EHP 2014) or the Commonwealth MNES Significant Impact Guidelines (DotE 2013).

Consequently, provided the proposed activities comply with the clearing limits outlined in Section 2.1 of the SRI Guideline and **Table 9**, the proposed development will not result in a significant residual impact to regulated vegetation.

Table 9: Significant Residual Impact test criteria and impact minimisation measures

MSES	Infrastructure type	SRI test criteria (EHP 2014)	Impact minimisation for the project
Regulated vegetation - within 100 m of a Vegetation Management Wetland	Linear	20 m wide in a sparse or very sparse RE; or 25 m wide in a grassland RE.	Linear infrastructure will be located outside Vegetation Management Wetlands, and greater than 50 m from the defining bank, where practicable. Where disturbance

MSES	Infrastructure type	SRI test criteria (EHP 2014)	Impact minimisation for the project
		Clearing must also occur within the wetland or within 50 m of the defining bank to trigger a SRI (as described in Section 3.5.1).	occurs in Vegetation Management Wetlands and within 50 m of the defining bank, it will comply with SRI clearing limits.
	Non-linear	2 ha within a sparse or very sparse RE; or 5 ha within in a grassland RE. Clearing must also occur within the wetland or within 50 m of the defining bank to trigger a SRI (as described in Section 3.5.1).	Non-linear infrastructure will be located outside Vegetation Management Wetlands, and greater than 50 m from the defining bank, where practicable. Where disturbance occurs in Vegetation Management Wetlands and within 50 m of the defining bank, it will comply with SRI clearing limits.
Regulated vegetation - intersecting a watercourse	Linear	20 m wide in a sparse or very sparse RE; or 25 m wide in a grassland RE. Clearing must also occur within the defined distance or within 5 m of the defining bank to trigger a SRI (as described in Section 3.5.1).	Linear infrastructure will be located outside the defined distance from the defining banks of Vegetation Management Watercourses and Drainage Features, where practicable. Where disturbance occurs within the defined distance of Vegetation Management Watercourses and Drainage Features and within 5 m of the defining bank, it will comply with SRI clearing limits.
	Non-linear	2 ha within a sparse or very sparse RE; or 5 ha within a grassland RE. Clearing must also occur within the defined distance or within 5 m of the defining bank to trigger a SRI (as described in Section 3.5.1).	Non-linear infrastructure will be located outside the defined distance from the defining banks of Vegetation Management Watercourses and Drainage Features, where practicable. Where disturbance occurs within the defined distance of Vegetation Management Watercourses and Drainage Features and within 5 m of the defining bank, it will comply with SRI clearing limits.

4.6 Protected wildlife habitat

The Significant Residual Impact Guidelines (EP Act) protected wildlife assessment framework applied to the following MSES:

- An area of essential habitat on the essential habitat map for an animal or plant that is endangered or vulnerable wildlife (section 2(3)(b), Schedule 2, EO Reg)
- An area that is shown as a high risk area on the flora survey trigger map and that contains plants that are endangered or vulnerable wildlife (section 6(1), Schedule 2, EO Reg)

- An area that is not shown as a high risk area on the flora survey trigger map, to the extent the area contains plants that are endangered or vulnerable wildlife (section 6(2), Schedule 2, EO Reg)
- An area of habitat (e.g. foraging, roosting, nesting or breeding habitat) for an animal that is endangered, vulnerable or a special least concern animal (section 6(4), EO Reg).

As described above, the protected wildlife habitat MSES is potentially present within the study area in the form of low potential habitat for the Grey Falcon, Major Mitchell's Cockatoo, Painted Honeyeater and *Indigofera oxyrachis* (**Table 10**).

As per the significant residual impact criteria presented in the Significant Residual Impact Guideline (EHP 2014), significant residual impacts to endangered and vulnerable wildlife may occur if the impact on habitat is likely to:

- Lead to a long-term decrease in the size of a local population; or
- Reduce the extent of occurrence of the species; or
- Fragment an existing population; or
- Result in genetically distinct populations forming as a result of habitat isolation; or
- Result in invasive species that are harmful to an endangered or vulnerable species becoming established in the endangered or vulnerable species' habitat; or
- Introduce disease that may cause the population to decline, or
- Interfere with the recovery of the species; or
- Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.

Detailed impact assessments for each species are contained in **Appendix F**.

Table 10: Summary of predicted residual impacts to MSES

Protected matter	Presence in the study area	Interaction with the project	Significant residual impact outcome
Threatened fauna species			
Grey Falcon	No direct observations made, or evidence of individuals identified during targeted surveys. 8,210 ha of potential habitat present	Removal of up to 64 ha of potential habitat.	Significant residual impact unlikely – assessment provided below
Major Mitchell's Cockatoo	No direct observations made, or evidence of individuals identified during targeted surveys. 5,262 ha of potential habitat present.	Removal of up to 64 ha of potential habitat.	Significant residual impact unlikely – assessment provided below
Painted Honeyeater	No direct observations made, or evidence of individuals identified during targeted surveys. 873 ha of potential habitat present.	Removal of up to 64 ha of potential habitat.	Significant residual impact unlikely – assessment provided below
Inidgofera oxyrachis	No direct observations made, or evidence of individuals identified during targeted surveys. 5,890 ha of potential habitat present	Removal of up to 64 ha of potential habitat.	Significant residual impact unlikely – assessment provided below

When considered against the significant impact criteria below (**Section 4.4**), it is not considered that the removal of up to 64 ha of potential foraging habitat for Grey Falcon, Major Mitchell's Cockatoo, Painted Honeyeater and *Indigofera oxyrachis* presents a significant residual impact because:

- There is no current evidence of the presence of the species within the study area and the presence of suitable habitat has been inferred from detailed RE mapping and associated habitat preferences for each species. The area subject to disturbance is not considered to be an ecologically significant location i.e. the clearing of 64 ha of habitat would not cause disruption to an ecologically significant location for the species.
- The upper disturbance limit of 64 ha is negligible in the context of the total area of potential habitat available within the study area for protected wildlife species. For Grey Falcon this is up to 0.8% of 8,210 ha, for Major Mitchell's Cockatoo this is up to 1.2% of 5,262 ha, for Painted Honeyeater this is up to 7.4% of 873 ha and for *Indigofera oxyrachis* this is up to 1.1% of 5,890 ha of available habitat.
- A large component of the total disturbance area will be temporary, with many areas being progressively rehabilitated and allowed to regenerate consistent with surrounding areas at the completion of construction activities.
- Final rehabilitation of disturbed areas would be undertaken to achieve the final rehabilitation criteria conditions specified in the relevant Environmental Authority.
- The Grey Falcon and Major Mitchell's Cockatoo are wide ranging mobile species that may undertake movements in response to changes in the suitability of habitat. This suggests that if present within the study area, any individuals affected by the relatively small increase in disturbance footprint should be able to relocate to nearby areas of suitable habitat that remain undisturbed. Further, the Painted Honeyeater is nomadic and moves in response to flowering mistletoe. The species potential presence within the study area are likely only limited to those events.
- Considering the linear nature of the proposed development impacts and mitigation measures to be implemented, potential impacts to important or breeding habitat (such as hollow-bearing trees) or large areas of foraging habitat (mistletoe) is considered unlikely or will otherwise be avoided where practicable.
- The disturbance will predominantly (>80%) occur in largely treeless grasslands, herblands/forblands and shrublands and will not result in significant fragmentation or isolation of populations, nor will the proposed development result in the introduction of invasive species or diseases.
- The disturbance will occur in a progressive nature, such that the total of 64 ha impact will not occur at the one time, but rather spread across a number of years.
- The habitat of the study area operates under a boom / bust cycle, which drives diversity and faunal activity (e.g., species respond to rains and multiple good seasons). The proposed, progressive native of the impacts, particularly with the implementation of mitigation measures, will not alter this natural cycle of boom / bust seasons.
- The proposed development will not interfere with any relevant recovery strategies.

4.7 Connectivity

As the proposed amendment does not relate to a fixed footprint, it cannot be assessed using the Landscape Fragmentation and Connectivity Tool. However, the significant impact criteria can be examined at a project scale.

A development impact on connectivity areas is determined to be significant if either of the following tests are true:

- The change in the core remnant ecosystem extent at the local scale (post impact) is greater than a threshold determined by the level of fragmentation at the regional scale; or
- Any core area that is greater than or equal to 1 ha is lost or reduced to patch fragments (core to non-core).

Test 1 - 100% of the study area is covered by remnant vegetation (**Section 3.3**) therefore the change threshold for test 1 is 50%. The proposed amendment will not result in the clearance of greater than 50% of the remnant vegetation across the study area.

Test 2 - The vegetation within the study area occurs in a large, consolidated remnant patch. The development of well sites and associated linear infrastructure in these remnant patches will not result in a core area being lost or reduced to patch fragments.

In conclusion, there are not expected to be any significant impacts on connectivity as a result of the proposed expansion.

4.8 Category A or B ESAs

In accordance with the *Environmental Protection Act 1994*, a resource activity is likely to lead to a significant increase in the risk of environmental harm if there are:

- Increasing impacts to Category A or B ESAs; and
- Increasing scale and nature of disturbances by a prescribed activity that will, or are likely to, result in a significant residual impact on a prescribed environmental matter (list in Schedule 1 and Schedule 2 of the *Environmental Offsets Regulation 2014* (EO Regulation).

The proposed development will not result in any direct impact on Category A or Category B ESAs as none are present in the study area. The proposed development is unlikely to have significant impact on any other prescribed matters and consequently, the risk of increased environmental harm is minimal.

4.9 State Environmental Offsets

Queensland Environmental offsets is directed under the Queensland offset framework consisting of the *Environmental Offsets Act 2014* (EO Act), EO Regulation and the Queensland Environmental Offset Policy 2021 (version 1.10). The environmental offset framework only applies when a prescribed activity is likely to have a significant residual impact on a prescribed environmental matter.

Prescribed environmental matters include MSES, which for activities authorised under the EP Act are defined in the EO Regulations as the following:

- regulated vegetation – prescribed REs that:
  - are endangered REs
  - are of concern REs
  - intersect with an area shown as a wetland on a vegetation management wetland map
  - contain an area of essential habitat on an essential habitat map for near threatened wildlife
  - are located within a defined distance of a relevant watercourse or drainage feature.
- connectivity areas
- wetlands and watercourses
- designated precinct in a strategic environmental area
- protected wildlife habitat
- protected areas

- highly protected zones of State marine parks
- fish habitat areas
- waterway providing for fish passage
- marine plants
- legally secured offset areas.

A 'prescribed activity' is also defined under the EO Regulations and includes activities requiring approval under the EP Act such as mining and petroleum activities. Significant residual impacts are determined by assessment against the definition in the EO Act and the application of criteria outlined in the appropriate significant residual impact guidelines.

In relation to the proposed expansion of works in the study area, significant residual impacts have been assessed above. The assessments concluded that a significant residual impact to prescribed MSES are unlikely, and therefore offsets are not considered to be required for this proposed development.

However, if at any stage the proposed activities are expected to cumulatively exceed SRI disturbance limits, Santos would need to re-assess future cumulative impacts.

4.10 Cumulative impacts

Within the study area, existing infrastructure includes 6 wells (consisting of 4 operational gas wells, and 2 plugged and abandoned wells), associated access tracks, borrow pits and a temporary camp area.

The total area of existing infrastructure totals approximately 44 ha. With the addition of up to 64 ha additional impact, the total cumulative impact in the study area is 108 ha, which equates to 1.3% of the study area.

The study area has also been subject to seismic survey activities, consisting of approximately 150 km of 2D and 450 km of 3D seismic survey lines, respectively. Total disturbance relating to seismic survey activities is estimated at up to 201 ha. However, due to the temporary low impact nature of seismic survey activities, the general avoidance of clearing, and regeneration observed to be occurring in the project area, the long-term impact of seismic surveying in the project area is considerably lower than 201 ha. When seismic surveys are considered, total cumulative impact is approximately 309 ha, which equates to approximately 3.8% of the study area.

Cumulative impacts within the study area are not considered to significantly impact any MSES or MNES.

Cumulative impacts across other tenures in the region have not been considered as part of this assessment.

5. Recommendations

Recommendations and mitigation measures to reduce the impacts of the proposed works, include:

- Restrict surface disturbance to the smallest area required for construction and operation activities.
- Co-locate surface disturbance with existing infrastructure (e.g. roads and pipelines) or disturbance (previously cleared areas) wherever possible.
- Maximise avoidance of vegetated drainage lines. Key principles include:
  - Locate infrastructure outside Vegetation Management Wetlands and greater than 50 m from the defining bank, where practicable – or otherwise comply with SRI clearing limits.
  - Locate infrastructure outside the defined distance from the defining banks of Vegetation Management Watercourses and Drainage Features, where practicable – or otherwise comply with SRI clearing limits.
  - Where disturbance is necessary, linear infrastructure should firstly seek to use existing crossings (i.e. roads and pipelines).
  - Where new crossings are required, they should cross perpendicularly.
- Maximum avoidance of important non-regulated vegetation wherever possible. Including maximising avoidance of trees (and trees with nests), particularly patches containing multiple individuals, hollows or hosting mistletoe.
- Maximise avoidance of steep terrain including cliff lines, particularly those with cave features, which provide important breeding, roosting, foraging and sheltering habitat for a range of common species in a hostile landscape (as shown on **Figure 7**).
- All caves representing important fauna habitat are to be avoided with appropriate buffers applied to minimise indirect impacts during construction and operation.
- Preparation and implementation of a rehabilitation strategy is recommended for all surface disturbance. Key principles would include appropriate management of topsoil and subsoil to conserve the soil seed bank and encourage establishment of native vegetation; retention of habitat features including rocks, logs and hollows; and sediment and erosion control.
- Final rehabilitation of disturbed areas should be undertaken to achieve the final rehabilitation criteria conditions specified in the relevant Environmental Authority.

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Appendix A – Likelihood of Occurrence Assessment

Table 11: Likelihood of occurrence assessment for the study area

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
Wetlands of International Importance						
Coongie Lakes (within the Coongie Lakes National Park) – South Australia				Located approximately 155 km south-west of the study area		
Wetlands of National Importance						
Coongie Lakes (within the Coongie Lakes National Park) – South Australia				Located approximately 155 km south-west of the study area		
Cooper Creek – Wilson River Junction – Queensland				Located approximately 67 km south-west of the study area		
Cooper Creek Swamps – Nappa Merrie – Queensland				Located approximately 83 km south-west of the study area		
Lake Yamma Yamma – Queensland				Located approximately 76 km south-west of the study area		
Birds						
Amytornis barbatus barbatus	Bulloo Grey Grasswren	E	NT	Occurs on periodically-inundated swampy floodplains in the drainage basin of the Bulloo River, in south western Queensland and north western NSW. May also inhabit patches of dense vegetation comprised of *Duma florulenta* (Lignum) thickets.	Unlikely	Eight species records greater than 35km to the north east and south east, south and south west of the study area (ALA, 2021) all associated with the braided channels and floodplains of Cooper Creek. No essential habitat (Lignum) was observed in the study area.
Calidris ferruginea	Curlew Sandpiper	CE, Mi	E	Species occurs along the Queensland coastline, with records indicating it is more widespread in coastal areas south of Cairns. Species forages and roosts in intertidal mudflats in sheltered coastal areas such as estuaries, bays, inlets and lagoons and also around non-tidal swamps, lakes and lagoons near the coast.	Unlikely	Study area is outside the expert distribution for the species, with no records nearby (ALA, 2021). Habitat not present.

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
Falco hypoleucos	Grey Falcon	V	V	Distribution is poorly known, likely to prefer timbered lowland plains that are crossed by tree-lined watercourses and adjacent to treeless areas, grasslands and open woodlands that are used for foraging.	Potential	Study area is within the very broad expert distribution, with eight records greater than 40 km to the south east, south, west and north west (ALA, 2021). Tree-lined watercourses present within the study area and tree-less areas. Species observed in RE 5.9.3 (tree-less) approximately 30 km to the south of the PL (ELA, 2021).
Grantiella picta	Painted Honeyeater	V	V	Species is rare migrant across eastern Australia. Occurs in mistletoes in Eucalypt forest, box-ironbark-yellow gum woodlands and *Casuarina* and *Acacia* dominated woodlands.	Potential	The study area contains REs on land zone 3 with Coolabah that may contain mistletoe. Although, mistletoe, an essential habitat feature for the bird was largely absent within the site, so habitat is marginal. Two records >42km away to the east and south east, one record from 2020 demonstrating the species presence within the region (ALA, 2021).
Lophochroa leadbeateri	Major Mitchell's Cockatoo	-	V	Found mainly in inland arid regions, west from St George in Queensland. Inhabits a wide variety of semi-arid and arid inland habitats, but prefers dry woodlands, particularly mallee *Eucalyptus – Callitris – Casuarina* vegetation communities.	Potential	The study area is just outside the expert distribution for the species, however five ALA records (recent; 2014) occur within 100km of the study area, one which is within 40km (ALA, 2021). Wide ranging species and limited habitat present.

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
Pedionomus torquatus	Plains-wanderer	CE	V	The species typically inhabits sparse, lowland native grasslands which are treeless and generally occur on hard red-brown soils. It has been recorded in areas with *Sclerolaena tricuspis* (Bindyi), *S. patenticuspis* (Spear-fruit Bindyi), *Atriplex stipitate* (Bitter Saltbush), *A. vesicaria* (Bladder Saltbush) and *Eriochiton sclerolaenoides* (Woolly-fruit Bluebush) as the dominant species.	Unlikely	The study area contains REs representative of potential habitat, including sparse open herbland and short grassland. However, the expert distribution is further to the east, north and west of the study area and no records occur within 100 km of the site (ALA, 2021). Furthermore, considering the dry conditions and field survey observations, the study area was not considered to contain preferred habitat (e.g. lowland native grasslands and/or scattered shrubs).
Pezoporus occidentalis	Night Parrot	E	E	Distribution is poorly known, however habitat is across the arid zone, in particular in association with spinifex hummock grasslands, on rocky ranges, and with open herbaceous flats around salt lakes.	Unlikely	The study area is within the expert distribution for the species, however no records nearby (ALA, 2021). Spinifex grasslands on rocky ranges and salt lakes are not present within the study area.
Rostratula australis	Australian Painted-snipe	E	E	Species is wetland dependent and can inhabit a variety of wetlands, including shallow terrestrial freshwater (occasionally brackish) wetlands, temporary and permanent lakes, swamps and claypans. Preferred wetland habitats are characterised by emergent vegetation (including tussocks, grasses, sedges, rushes, reeds, cane grass and/or paperbarks) where nesting will occur. Artificial habitats that are occasionally used include reservoirs, farm dams, sewage ponds, inundated grasslands, and leaking irrigation channels.	Unlikely	The study area is close to the expert distribution for the species, however no records nearby (ALA, 2021). No natural wetland habitats present within site. Limited dams are present, however they did not contain emergent vegetation.
Mammals						
Dasyuroides byrnei	Kowari (Byrne's Crest-tailed Marsupial Rat)	V	V	Primarily found in south western Queensland with a patchy distribution. Occurs in extensive stony (gibber) deserts, mostly	Unlikely	The study area is close to the expert distribution for the species (west of Lake Yamma Yamma),

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
				associated with patches of softer soils (sand dunes and river channels) and/or ephemeral swamps.		however no records nearby (ALA, 2021). While gibbers areas present, areas associated with softer soils (e.g. sand dunes and river channels) are largely absent
Macroderma gigas	Ghost Bat	V	E	The species current range is discontinuous, and populations in Queensland are highly distinct from each other. In Queensland, colonies occur in the Gulf of Carpentaria, coastal and near coastal areas from Cape York to Rockhampton and the Camooweal and Riversleigh districts. The species roosts in caves, rock crevices and old mines that are generally deep, with stable temperatures and moderate to high humidity. A range of cave sites is required as the species moves between sites seasonally, or as weather conditions dictate. Only a few breeding roost sites are known, which individuals concentrate towards when breeding, otherwise being highly dispersed throughout its range (TSSC, 2016).	Unlikely	The study area is outside of the species' distribution. There is one undated record 60 km from the study area (ALA, 2022a), however, the species has undergone significant range contractions away from central Australia and no specimens have been collected from the arid zone since 1961 (TSSC, 2016). The species was not recorded during field surveys.
Macrotis lagotis	Greater Bilby	V	E	Restricted to an outlying population between Boulia and Birdsville in the southwest. Species occurs in a variety of habitats, usually on landforms with level to low slope topography and light to medium soils. May prefer open tussock grassland on uplands and hills, mulga woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas.	Unlikely	The study area is within or very close to the expert distribution for the species, however there are no records nearby (ALA, 2021). Habitat within the study area not considered suitable.
Notomys fuscus	Dusky Hopping Mouse	V	E	Species typically occupies a diversity of soft sandy habitats across its range, preferring sand dunes, sand hills and ridges with sandhill canegrass (*Zygochloa paradoxa*), sandhill wattle (*Acacia ligulata*), nitre bush (*Nitraria billardieri*) and sticky hopbush (*Dodonaea viscosa*). It traverses but does not inhabit inter-dune swales and gibber plains, and typically does not occur in sand dunes containing Spinifex (*Triodia* sp.).	Unlikely	The study area is outside the known distribution and does not contain suitable dune habitats. Expert species distribution is to the west of the study area (ALA, 2021). However, one ALA (2021) records occurs within 80 km of the site.
Petrogale xanthopus celeris	Yellow-footed Rock-wallaby	V	V	Restricted distribution in the rocky ranges of central western Queensland. Primary habitat includes rugged rocky areas, along the	Unlikely	Distribution is further east of the study area (ALA, 2021). Habitat absent within site. One record to

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
	(central-western Queensland)			edges of low sandstone tablelands and hills, utilising caves and rock crevices.		the north east 100km from the site (ALA, 2021).
Pseudomys australis	Plains Mouse	V	E	Restricted to the gibber plains of the Lake Eyre Basin in northern South Australia. The species is presumed extinct in Queensland, NSW and Victoria (DOE, 2022; ALA, 2022). Outlying recent records (from 2001) of the species in Diamantina National Park come from remains extracted from Barn Owl pellets. These are likely representative of large scale dispersal by predators, or due to temporary increases in the species' spread after favourable seasonal conditions, rather than an indication of a permanent population (Moseby, 2012).	Unlikely	Restricted to northern South Australia. Records in Queensland are north of the study area and are not representative of a permanent population, rather outlying records of the species' remains. Presumed extinct in Queensland.
Reptiles						
Aspidites ramsayi	Woma	-	NT	Found throughout arid and semi-arid Australia, particularly in the dry subtropics to the west in Queensland. Occupies a wide variety of dry habitats from spinifex desert to brigalow, eucalypt and acacia woodlands, heaths and shrublands.	Potential	Recorded west of Durham Downs to the south of the study area (ALA, 2021). May occur in the study area due to the broad habitat preference.
Plants						
Frankenia plicata	Sea Heath	E	-	Grows in a range of habitats, including on small hillside channels, which take the first run-off after rain. Found in a wide range of vegetation communities that have good drainage, such as loamy sands.	Unlikely	Found further west of the study area (ALA, 2019). Potential habitat limited within the study area.
Indigofera oxyrachis	-	-	V	Queensland herbarium species notes identifies specimens recorded on stony rise on cracking clay; open area amongst low gidgee woodland, with *Senna artemisioides* and *Senna phyllodinea.* Also on open scalded creek flats at base of escarpment; open mixed woodland on light clay; sandy creek lines throughout; stony patches.	Potential	Little is known about the species. All ALA records for the species are further north and east of the study area, and east of Cooper Creek (ALA, 2021), this includes 3 records between 77 km and 95 km from the site. However potential suitable habitat is widespread throughout the study area.
Rhodanthe rufescens	-	-	NT	Little is known about the species, however previous records have identified the species in areas of *Acacia aneura* woodland with	Unlikely	Little is known about the species. 1 record >90 km north east of the

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
				Eucalyptus populnea on orange sandy loam soils (QLD Herbarium 2019b)		site (ALA, 2021). Suitable habitat (*Acacia aneura* woodland with *Eucalyptus populnea*) is absent.
Sclerolaena walkeri	-	V	-	Found in central Queensland on saline river flats, such as in Currawinya National Park.	Unlikely	Primarily found further east or north of the study area (ALA, 2021). Habitat absent within site.
Xerothamnella parvifolia		V	-	Occurs on stony ridges and lower slopes of rocky escarpments, often in association with *Acacia cambegei*. Soil type is variable (SPRAT 2008).	Unlikely	No ALA records within 100 km of the site (ALA, 2021). The study area is outside the species known range.
Migratory						
Actitis hypoleucos	Common Sandpiper	Mi	SL	Found along the coastlines of Australia, including several areas inland. The species utilises a wide range of wetland habitats of varying levels of salinity, and forages in shallow water and on bare soft mud at the edges of wetlands.	Unlikely	The study area is within or very close to the expert distribution for the species, there is one record nearby >77 km south west of the site (ALA, 2021). Wetland habitats absent from site.
Apus pacificus	Fork-tailed Swift	Mi	SL	Species is predominantly aerial and occurs over inland areas and occasionally above the foothills in coastal areas with dry and open habitat. Can also occur over low scrub, heathland, saltmarsh and riparian woodlands and are associated with low pressure systems that favour the occurrence of insect prey.	Potential fly-over species	Records throughout the area, to the south east, south and south west over >40 km away from the site (ALA, 2021). Primarily aerial species which is not considered to utilise the study area. Furthermore, it is considered unlikely that an ecological significant important proportion of population of Fork-tailed Swifts occur within the study area, or are likely to be dependent on habitat in the study area for their long-term survival

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
Calidris acuminata	Sharp-tailed Sandpiper	Mi	SL	Species prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. Inland habitats include dams, waterholes, soaks, bore drains and bore swamps and saltpans.	Unlikely	Species records are primarily coastal, however there are 12 records within 100 km of the site, to the north (at Lake Yamma Yamma) and south, one of which is within 50 km (ALA, 2021). Wetland habitats absent from site.
Calidris ferruginea	Curlew Sandpiper	CE, Mi	E	Species occurs along the Queensland coastline, with records indicating it is more widespread in coastal areas south of Cairns. Species forages and roosts in intertidal mudflats in sheltered coastal areas such as estuaries, bays, inlets and lagoons and also around non-tidal swamps, lakes and lagoons near the coast.	Unlikely	The study area is outside the expert distribution for the species, with no records nearby (ALA, 2021).
Calidris melanotos	Pectoral Sandpiper	Mi	-	Species generally occurs in coastal or near coastal habitat but is occasionally found further inland. Prefers wetlands that have open fringing mudflats and low, emergent or fringing vegetation.	Unlikely	The study area is outside the expert distribution for the species, with no records nearby (ALA, 2019).
Gallinago hardwickii	Latham's Snipe	Mi	-	Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies).	Unlikely	The study area is outside the expert distribution for the species, with no records nearby (ALA, 2019).
Motacilla cinerea	Grey Wagtail	Mi	-	Primarily recorded in the Cairns/Townsville region and the Cape York Peninsula as a summer migrant. Prefers running water in disused quarries, sandy and rocky streams in escarpments and rainforests, sewage ponds, ploughed fields, and airfields.	Unlikely	ALA records are more than 80 km from the study area (ALA, 2019). Suitable habitat unlikely to occur on the site.
Motacilla flava	Yellow Wagtail	Mi	-	Species is a summer migrant to north-east Queensland, occurring in a variety of habitats with short grass and bare ground, swamp margins, sewage ponds, saltmarshes, playing fields and town lawns.	Unlikely	Habitat variable but no records within 100km of the study area (ALA, 2019).
Plegadis falcinellus	Glossy Ibis	Mi	SL	Occurs in freshwater marshes at the edges of lakes and rivers, lagoons, flood-plains, wet meadows, swamps, reservoirs, sewage ponds and cultivated areas under irrigation.	Unlikely	Species is recorded close to study area (three records within 25 km) at Cooper Creek to the east of the site (ALA, 2021) with multiple

Scientific Name	Common Name	EPBC Act [1]	NC Act[1]	Habitat Associations	Likelihood	Justification
						records between 30 km and 100 km in all directions. Suitable habitat absent within the study area.
Tringa nebularia	Common Greenshank	Mi	SL	Species occurs in all types of wetlands. Typical habitat includes a wide variety of inland wetlands and sheltered coastal habitats of varying salinity.	Unlikely	Species is likely to be found near Lake Yamma Yamma (six records (ALA 2021), however is unlikely to utilise the study area (ALA, 2021).

1 Current status under the EPBC Act: CE = Critically; E = Endangered; V = Vulnerable; M = Migratory OR NC Act: E = Endangered; V = Vulnerable; NT = Near Threatened; SL = Special Least Concern

Note: Marine listed species have been removed from the likelihood assessment due to the location.

Appendix B – Regional Ecosystem Profiles

Table 12: RE 5.3.21a

Item	Description
RE	5.3.21a
Short Description	Variable sparse to open herbland, *Senna* spp. open shrubland and bare scalded areas on infrequently flooded alluvia of major rivers their distributaries, drainage channels and creeks
Community Name	Open herbland on alluvial flats
VMA Class	Least concern
Status	No concern at present
General location	Bare areas in major alluvial systems
Photo	
Area mapped (ha)	187 hectares
Landform Element	Flat
Landform Pattern	Alluvial plain
Vegetation Structure	Sparse
Dominant canopy species	N/A
Dominant midstorey species	N/A
Dominant groundcovers	N/A
Tree canopy (EDL) Height (m)	N/A
Tree richness	0
Shrub richness	1
Grass & grass-like richness	0

Item	Description
Forb and other richness	1
Tree canopy cover	0
Shrub canopy	0
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	0
Native perennial grass cover	0
Total litter cover	0
Rock cover	21-30%
Bare ground cover	51-80%
Length of fallen logs	0m
Qualitative vegetation condition (overall)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)

Table 13: RE 5.3.4

Item	Description
RE	5.3.4
Short Description	*Eucalyptus camaldulensis* +/- *Acacia aneura* +/- *Acacia cambagei* +/- *Acacia georginae* +/- *Acacia cyperophylla* woodland on drainage lines within ranges
Community Name	Mineritchie, River Red Gum, Coolabah and Gidgee woodland on larger drainage lines
VMA Class	Least Concern
Status	No concern at present
General location	Major watercourses in the central north and south-west, south-east and east
Photo	
Area mapped (ha)	290 hectares
Landform Element	Open depression, Flat
Landform Pattern	Alluvial plain, Plain
Vegetation Structure	Very low woodland to low woodland
Dominant canopy species	*Acacia cambagei*, *Acacia cyperophylla* var. *cyperophylla*, *Acacia aneura* var. *aneura*, *Eucalyptus camaldulensis* subsp. *arida*., *Eucalyptus coolabah*, *Owenia acidula*, *Atalaya hemiglauca*
Dominant midstorey species	*Maireana* sp., *Acacia aneura* var. *aneura*, *Eremophila glabra* subsp. *glabra*, *Capparis mitchellii*, *Eucalyptus camaldulensis* subsp. *arida*, *Rhagodia spinescens*, *Eremophila latrobei* subsp. *latrobei*, *Atalaya hemiglauca*, *Santalum lanceolatum*, *Senna artemisioides* subsp. *oligophylla*, *Atriplex* sp.
Dominant groundcovers	*Dipteracanthus australasicus* subsp. *australasicus*, *Sclerolaena* sp., *Enteropogon acicularis*, *Paspalidium* sp., *Digitaria* sp., *Abutilon* sp., *Marsilea drummondii*, *Aristida* sp., *Enneapogon* sp.
Tree canopy (EDL) Height (m)	4-10m
Tree richness	0 to 4
Shrub richness	0 to 5
Grass & grass-like richness	2 to 6

Item	Description
Forb and other richness	5 to 10
Tree canopy cover	11-30%
Shrub canopy	0-10%
Number of large trees Eucalypt	1 to 20
Number of large trees Non-Eucalypt	
Native perennial grass cover	0-20%
Total litter cover	0-30%
Rock cover	21-80%
Bare ground cover	31-80%
Length of fallen logs	26-300m
Qualitative vegetation condition (overall)	High (>80-90% benchmark, minor disturbance) to Very High (>90% benchmark, undisturbed, natural)

Table 14: RE 5.7.1

Item	Description
RE	5.7.1
Short Description	*Acacia shirleyi* +/- *Acacia catenulata* +/- *Acacia aneura* +/- *Acacia cyperophylla* var. *cyperophylla* low woodland on scarps and crests of residuals
Community Name	Mulga on crests and upper slopes of dissected tablelands
VMA Class	Least concern
Status	No concern at present
General location	Upper slopes and crests of dissected residuals
Photo	
Area mapped (ha)	1,844 hectares
Landform Element	Variable from open depression, mid and upper slopes and crests
Landform Pattern	Low hill
Vegetation Structure	Variable from very low woodland to tall open shrubland
Dominant canopy species	*Acacia aneura, Corymbia terminalis, Atalaya hemiglauca, Acacia cambagei*
Dominant midstorey species	*Acacia* sp., *Eremophila glabra, Eremophila* sp., *Acacia sibirica, Dodonaea viscosa* subsp. *spatulata, Owenia acidula, Solanum* sp., *Senna* sp., *Capparis mitchellii, Maireana* sp.
Dominant groundcovers	*Aristida* sp., *Salsola australis, Scaevola spinescens, Ptilotus* sp., *Maireana* sp., *Enneapogon* sp., *Dipteracanthus australasicus* subsp. *australasicus*., *Atriplex* sp., *Sclerolaena tricuspis, Cheilanthes sieberi* subsp. *sieberi, Sclerolaena bicornis* var. *bicornis*
Tree canopy (EDL) Height (m)	1 to 10 m
Tree richness	1 to 2
Shrub richness	2 to 5
Grass & grass-like richness	1 to 5
Forb and other richness	2 to 5

Item	Description
Tree canopy cover	0-50%
Shrub canopy	0-30%
Number of large trees Eucalypt	0 to 5
Number of large trees Non-Eucalypt	0-1
Native perennial grass cover	0-30%
Total litter cover	0-30%
Rock cover	51->80%
Bare ground cover	0-20%
Length of fallen logs	1-200m
Qualitative vegetation condition (overall)	Variable from Moderate (>50-70% benchmark, moderate disturbance, mature regrowth) to High (>80-90% benchmark, minor disturbance)

Table 15: RE 5.7.13

Item	Description
RE	5.7.13
Short Description	*Acacia cyperophylla* var. *cyperophylla* +/- *Acacia cambagei* or *Acacia georginae* +/- *Atalaya hemiglauca* tall shrubland on drainage lines
Community Name	Mineritchie shrubland on minor drainage lines
VMA Class	Least concern
Status	No concern at present
General location	Widespread on minor to major drainage lines in tableland and dissected tableland country
Photo	
Area mapped (ha)	583 hectares
Landform Element	Open depression
Landform Pattern	Plain to low hill
Vegetation Structure	Variable from very low open woodland to tall shrubland
Dominant canopy species	*Acacia cyperophylla* var. *cyperophylla*, *Acacia cambagei*, *Acacia aneura, Acacia oswaldii, Atalaya hemiglauca, Ventilago viminalis, Grevillea striata*
Dominant midstorey species	*Eremophila latrobei* subsp. *latrobei., Eremophila glabra* subsp. *glabra., Senna artemisioides* subsp. *oligophylla, Atalaya hemiglauca, Acacia cambagei, Acacia sibirica*
Dominant groundcovers	*Dipteracanthus australasicus* subsp. *australasicus, Maireana* sp., *Enneapogon acicularis, Ptilotus* sp., *Sporobolus actinocladus, Sida spp., Marsilea drummondii*
Tree canopy (EDL) Height (m)	1-10m
Tree richness	1-3
Shrub richness	2-10
Grass & grass-like richness	2-5
Forb and other richness	5-10

Item	Description
Tree canopy cover	0-30%
Shrub canopy	0-20%
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	11 to 100
Native perennial grass cover	2 to 5
Total litter cover	0- 40%
Rock cover	11->80%
Bare ground cover	11-80%
Length of fallen logs	0-200m
Qualitative vegetation condition (overall)	Variable from Moderate (>50-70% benchmark, moderate disturbance, mature regrowth) to Very High (>90% benchmark, undisturbed, natural)

Table 16: RE 5.7.5

Item	Description
RE	5.7.5
Short Description	*Acacia sibirica* open shrubland +/- *Acacia aneura* +/- *Acacia shirleyi* +/- *Triodia* spp. open shrubland on crests and tops of dissected tablelands and ranges
Community Name	*Acacia sibirica* shrubland on the crests of dissected tablelands
VMA Class	Least concern
Status	No concern at present
General location	Widespread on crests and flats in tableland country, located above 5.7.1
Photo	
Area mapped (ha)	476 hectares
Landform Element	From crests to flats
Landform Pattern	Plateaus
Vegetation Structure	Shrubs 0.25–2m, Cover Shrubs 0.25–2 m, Low open shrubland
Dominant canopy species	N/A
Dominant midstorey species	*Acacia sibirica, Eremophila* sp., *Scaevola spinescens*
Dominant groundcovers	*Enneapogon* sp. or no groundcovers
Tree canopy (EDL) Height (m)	1-3m
Tree richness	0
Shrub richness	2 to 3
Grass & grass-like richness	1 to 2
Forb and other richness	5
Tree canopy cover	0

Item	Description
Shrub canopy	0-20%
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	0
Native perennial grass cover	0
Total litter cover	
Rock cover	51-80%
Bare ground cover	21-30%
Length of fallen logs	0m
Qualitative vegetation condition (overall)	Low-Moderate (>30-50% benchmark, moderate disturbance, regrowth) to Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)

Table 17: RE 5.7.6

Item	Description
RE	5.7.6
Short Description	*Acacia cambagei* tall shrubland +/- *Triodia* spp. +/- *Senna* spp. on scarp footslopes and eroding pediments
Community Name	Gidgee on mid to lower slopes of dissected tablelands
VMA Class	Least concern
Status	No concern at present
General location	Located directly below 5.7.1 on moderate slopes in dissected tableland country
Photo	
Area mapped (ha)	929 hectares
Landform Element	Lower to mid slope
Landform Pattern	Low hill
Vegetation Structure	Trees<5m, Cover <10%, V low open woodland
Dominant canopy species	*Acacia cambagei, Acacia aneura, Atalaya hemiglauca*
Dominant midstorey species	*Acacia aneura, Acacia cambagei, Senna artemisioides* subsp. *oligophylla, Eremophila latrobei* subsp. *latrobei, Eremophila glabra* subsp. *glabra, Acacia sibirica*
Dominant groundcovers	*Enteropogon acicularis, Maireana* sp., *Atriplex* sp., *Neobassia proceriflora, Sclerolaena eriacantha*
Tree canopy (EDL) Height (m)	4-5m
Tree richness	1
Shrub richness	4 to 5
Grass & grass-like richness	2 to 4
Forb and other richness	5
Tree canopy cover	0-20%

Item	Description
Shrub canopy	0-20%
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	0
Native perennial grass cover	0-10%
Total litter cover	11-20%
Rock cover	51->80%
Bare ground cover	11-30%
Length of fallen logs	26-50m
Qualitative vegetation condition (overall)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well) to High (>80-90% benchmark, minor disturbance)

Table 18: RE 5.9.1

Item	Description
RE	5.9.1
Short Description	*Senna* spp., *Eremophila* spp. +/- *Acacia* spp. +/- *Maireana* spp. open shrublands on fresh Cretaceous sediments and Cretaceous or Tertiary limestones
Community Name	Senna shrublands on flat and gently undulating stony plains
VMA Class	Least concern
Status	No concern at present
General location	Widespread on gently undulating stony country
Photo	
Area mapped (ha)	650 hectares
Landform Element	Variable from open depression to mid slope
Landform Pattern	Variable from plain, low hill to plateau
Vegetation Structure	Low open shrubland to tall shrubland
Dominant canopy species	Occasional emergent *Acacia cambagei* and/or *Acacia aneura* var. *aneura,*
Dominant midstorey species	*Senna phyllodinea, Senna artemisioides* subsp. *oligophylla Eremophila latrobei* subsp. *latrobei, Senna artemisioides* subsp. *helmsii, Atalaya hemiglauca, Acacia tetragonophylla, Eremophila* sp.
Dominant groundcovers	*Aristida contorta, Sclerolaena* sp., *Astrebla pectinata, Enneapogon* sp., *Neobassia proceriflora, Sclerolaena eriacantha, Lepidium phlebopetalum*
Tree canopy (EDL) Height (m)	<1-3m
Tree richness	0 to 1
Shrub richness	0 to 5
Grass & grass-like richness	2 to 4
Forb and other richness	5 to 5

Item	Description
Tree canopy cover	0-20%
Shrub canopy	0-10%
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	0 to 5
Native perennial grass cover	0-20%
Total litter cover	0-10%
Rock cover	51->80%
Bare ground cover	5-30%
Length of fallen logs	0-25m
Qualitative vegetation condition (overall)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth) to Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)

Table 19: RE 5.9.2

Item	Description
RE	5.9.2x1
Short Description	*Senna artemisioides* subsp. *helmsii* +/- *Senna artemisioides* subsp. *oligophylla* +/- *Acacia georginae* +/- *Acacia* spp. open shrubland on Cambrian limestone
Community Name	Gidgee woodland on flat and gently undulating stony plains
VMA Class	Least concern
Status	No concern at present
General location	Located on undulating stony country. Similar to 5.7.6 but differs on landscape position
Photo	
Area mapped (ha)	1,139
Landform Element	Mainly occurs mid slope but variable from open depression to lower slope
Landform Pattern	Mainly low hill
Vegetation Structure	Very low open woodland
Dominant canopy species	*Acacia cambagei, Acacia oswaldii*
Dominant midstorey species	*Eremophila latrobei subsp. latrobei, Senna artemisioides* subsp. *oligophylla, Senna phyllodinea, Ventilago viminalis*
Dominant groundcovers	*Sclerolaena eriacantha, Atriplex* sp., *Enteropogon acicularis, Neobassia proceriflora, Lepidium phlebopetalum, Maireana georgei, Salsola australis, Sclerolaena longicuspis, Sporobolus actinocladus, Enneapogon* sp., *Sida* sp., *Sclerolaena tricuspis, Tecticornia* sp., *Enchylaena tomentosa, Sporobolus actinocladus*
Tree canopy (EDL) Height (m)	1-5m
Tree richness	1
Shrub richness	1 to 3
Grass & grass-like richness	2 to 5

Item	Description
Forb and other richness	5 to 10
Tree canopy cover	0-20%
Shrub canopy	0-10%
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	0
Native perennial grass cover	0-10%
Total litter cover	0-20%
Rock cover	51->80%
Bare ground cover	10-30%
Length of fallen logs	0-200m
Qualitative vegetation condition (overall)	Variable from Moderate (>50-70% benchmark, moderate disturbance, mature regrowth) to High (>80-90% benchmark, minor disturbance)

Table 20: RE 5.9.3

Item	Description
RE	5.9.3
Short Description	*Astrebla* spp. +/- short grasses +/- forbs open herbland on Cretaceous sediments
Community Name	Barely Mitchell Grass grassland/herbland on flat and gently undulating stony plains
VMA Class	Least concern
Status	No concern at present
General location	Widespread on tablelands and gently undulating country
Photo	
Area mapped (ha)	1,700 hectares
Landform Element	Flat to Mid Slope
Landform Pattern	Plain to Low hill
Vegetation Structure	Open herbland to sparse/open tussock grassland
Dominant canopy species	N/A
Dominant midstorey species	N/A
Dominant groundcovers	*Astrebla pectinata, Sclerolaena eriacantha, Aristida* sp., *Sclerolaena* sp., *Iseilema* sp., *Euphorbia tannensis*
Tree canopy (EDL) Height (m)	N/A
Tree richness	0
Shrub richness	0 to 2
Grass & grass-like richness	2 to 5
Forb and other richness	5 to 10
Tree canopy cover	0

Item	Description
Shrub canopy	0
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	0
Native perennial grass cover	11-20%
Total litter cover	0-10%
Rock cover	51->80%
Bare ground cover	5-50%
Length of fallen logs	N/A
Qualitative vegetation condition (overall)	Variable from Moderate (>50-70% benchmark, moderate disturbance, mature regrowth) to High (>80-90% benchmark, minor disturbance)

Table 21: RE 5.9.5

Item	Description
RE	5.9.5
Short Description	*Atriplex* spp. and/or *Sclerolaena* spp. and/or *Salsola australis* open herbland on Cretaceous sediments
Community Name	Open herbland on flat and gently undulating stony plains
VMA Class	Least concern
Status	No concern at present
General location	Restricted to eastern parts of the undulating country
Photo	
Area mapped (ha)	411 hectares
Landform Element	Flat
Landform Pattern	Plain
Vegetation Structure	Sparse to open herbland
Dominant canopy species	N/A
Dominant midstorey species	Occasional *Atalaya hemiglauca* and/or *Senna artemisioides* subsp. *oligophylla,*
Dominant groundcovers	*Sclerolaena* sp.*, Neobassia proceriflora*, *Euphorbia tannensis* Poaceae
Tree canopy (EDL) Height (m)	N/A
Tree richness	0
Shrub richness	0 to 2
Grass & grass-like richness	2
Forb and other richness	5
Tree canopy cover	0

Item	Description
Shrub canopy	0
Number of large trees Eucalypt	0
Number of large trees Non-Eucalypt	0
Native perennial grass cover	0
Total litter cover	0-10%
Rock cover	>80%
Bare ground cover	5-20%
Length of fallen logs	N/A
Qualitative vegetation condition (overall)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)

Appendix C – BioCondition Profiles

Plot ID	RBP40	RBP41	RBP42	RBP43	RBP44	RBP45	RBP46	RBP47	RBP48	RBP49	RBP50	RBP51	RBP52	RBP53
Regional Ecosystem	5.9.3	5.7.1	5.7.6	5.9.3	5.9.3	5.7.1	5.7.1	5.7.1	5.7.13	5.7.1	5.9.1	5.3.4	5.7.6	5.7.1
Habitat description (general)	Tussock grassland on stony plains	Acacia shrubland on scarps and drainage line	Acacia woodland below shrubland on gentler slopes	Open tussock grassland on rolling stony plains	Open tussock grassland on rolling stony plains	Shrubland on rocky sloped	Mulga woodland in steep rocky gully!	Mulga woodland in rocky drainage	Acacia woodland on drainage line	Very open low woodland on rocky plateau	Acacia shrubland on plateau	Acacia woodland on alluvial drainage	Acacia cambagei open woodland on rocky lower slopes	Scree slopes below caves
Vegetation Structure (Specht)	Tussock grasses, Cover 10-29%, Open tussock grassland	Shrubs>2m, Cover <10%, Tall open shrubland	Trees<5m, Cover <10%, V low open woodland	Tussock grasses, Cover <10%, Sparse tussock grassland	Tussock grasses, Cover 10-29%, Open tussock grassland	Trees<5m, Cover <10%, V low open woodland	Trees 5–10m, Cover 10-29%, Low woodland	Trees 5–10m, Cover 30-69%, Low open forest	Trees 5–10m, Cover <10%, Low open woodland	Trees<5m, Cover <10%, V low open woodland	Shrubs 0.25–2m, Cover Shrubs 0.25–2 m, Low open shrubland	Trees<5m, Cover 10-29%, V low woodland	Trees<5m, Cover <10%, V low open woodland	Shrubs>2m, Cover <10%, Tall open shrubland
Landform element	Flat	Upper slope	Mid Slope	Flat	Mid Slope	Upper slope	Open depression	Open depression	Open depression	Crest	Flat	Open depression	Lower slope	Mid Slope
Landform pattern	Plain	Low hill	Low hill	Plain	Plain	Low hill	Low hill	Low hill	Low hill	Plateau	Plateau	Alluvial plain	Low hill	Low hill
Emergent height (m)														
Tree canopy (EDL) Height (m)		4-5m	4-5m			4-5m	6-10m	6-10m	6-10m	4-5m		4-5m	4-5m	1-3m
Benchmark (count)	0	3-8	3-8	0	0	3-8	3-8	3-8	4-11	3-8	5-6	6-12	3-8	3-8
Tree richness assessment	0	1	1	0	0	1	1	1	2	2	0	2	1	2
Benchmark (count)	0-4	1-6	5-9	0-4	0-4	1-6	1-6	1-6	3-8	1-6	5-12	5-10	5-9	1-6
Shrub richness assessment	0	4	5	0	0	3	4	4	3	3	5	5	4	5
Benchmark (count)	5-16	1-7	9-14	5-16	5-16	1-7	1-7	1-7	3-13	1-7	2-6	9	9-14	1-7
Grass & grass-like richness assessment	5	2	4	5	5	5	2	1	3	2	2	4	2	1
Benchmark (count)	4-28	7	12-23	4-28	4-28	7	7	7	3-15	7	7-16	3-9	12-23	7
Forb and other richness assessment	10	4	5	5	5	5	5	5	5	4	5	5	5	5
Benchmark (m)	0	3-8	3-8	0	0	3-8	3-8	3-8	4-11	3-8	5-6	6-12	3-8	3-8
Tree canopy height assessment		4-5m	4-5m			4-5m	6-10m	6-10m	6-10m	4-5m		4-5m	4-5m	1-3m
Benchmark (%)	0	8-20	2-15	0	0	8-20	8-20	8-20	5-15	8-20	0-1	8-20	2-15	8-20
Tree canopy cover assessment	0	0-10%	0-10%	0	0	0-10%	11-20%	41-50%	11-20%	0	0	11-20%	0-10%	0-10%
Benchmark (%)	0-1	5-60	0-1	0-1	0-1	5-60	5-60	5-60	0-5	5-60	0-10	0-5	0-1	5-60
Shrub canopy cover assessment	0	11-20%	11-20%	0	0	0-10%	21-30%	11-20%	11-20%	0-10%	0-10%	0-10%	0-10%	21-30%
Benchmark (count)	na	no data	no data	na	na	no data	no data	no data	no data	no data	no data	no data	no data	no data
Number of large trees Eucalypt		0	0			0	0	0	0	1-5	0	0	0	0
Benchmark (count)	na	no data	no data	na	na	no data	no data	no data	no data	no data	no data	no data	no data	no data
Number of large trees Non-Eucalypt		6-10	11-20			6-10	>100	>100	41-50	6-10	0	21-30	41-50	0
Benchmark (%)	1-30	5-70	no data	1-30	1-30	5-70	5-70	5-70	no data	5-70	no data	5-30	no data	5-70

Plot ID	RBP40	RBP41	RBP42	RBP43	RBP44	RBP45	RBP46	RBP47	RBP48	RBP49	RBP50	RBP51	RBP52	RBP53
Native perennial grass cover	11-20%	0-10%	0-10%	11-20%	11-20%	21-30%	0-10%	0	0	0	11-20%	11-20%	0	0
Benchmark (%)	4-6	no data	no data	4-6	4-6	no data	no data	no data	no data	no data	no data	no data	no data	no data
Total litter cover	0-10%	0-10%	11-20%	0-10%	0-10%	0-10%	11-20%	21-30%	0-10%	0-10%	0-10%	11-20%	11-20%	0-10%
Rock cover	51-80%	51-80%	>80%	>80%	>80%	51-80%	>80%	51-80%	>80%	>80%	51-80%	31-50%	>80%	>80%
Bare ground cover	21-30%	21-30%	11-20%	0.1	0.05	21-30%	0.1	11-20%	11-20%	11-20%	21-30%	31-50%	11-20%	0
Benchmark (m)	na	no data	no data	na	na	no data	no data	no data	no data	no data	10	no data	no data	no data
Length of fallen logs		1-25m	26-50m			1-25m	101-200m	101-200m	26-50m	1-25m	0m	101-200m	26-50m	0m
Benchmark (%)	na	100	100	na	na	100	100	100	100	100	100	100	100	100
Proportion of dominant canopy (EDL) species with evidence of recruitment	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.5	0	0.25	0.25	0.25	0.25
Qualitative vegetation Condition (overall)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	High (>80-90% benchmark, minor disturbance)	High (>80-90% benchmark, minor disturbance)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Very High (>90% benchmark, undisturbed, natural)	High (>80-90% benchmark, minor disturbance)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)

BioCondition Plots RBP54 – RBP67

Plot ID	RBP54	RBP55	RBP56	RBP57	RBP58	RBP59	RBP60	RBP61	RBP62	RBP63	RBP64	RBP65	RBP66	RBP67
Regional Ecosystem	5.7.13	5.7.1	5.9.2	5.9.5	5.9.1	5.9.5	5.9.2	5.9.3	5.7.13	5.9.2	5.9.1	5.9.2	5.7.1	5.7.13
Habitat description (general)	Rocky drainage line dominated by Minni Richi	Acacia shrubland on stony crest and gentle slopes	Low open Gidgee woodland on very stony undulating slopes	Herbland on stony undulating plains	Gidgee on rocky drainage line in 5.9 country	Open herbland on rocky undulating plains	Low Gidgee woodland on drainage line in rocky undulating country	Open herbland grassland on stony plains	Gidgee woodland on stony drainage line in rolling downs country	Very open gidgee woodland with samphire shrubland	Shrubland and grassland on undulating stony plain	Gidgee open woodland on lower slopes in undulating country	Open mulga shrubland on steep rocky slopes and crest	Mulga shrubland on rocky drainage line
Vegetation Structure (Specht)	Trees 5–10m, Cover 10-29%, Low woodland	Shrubs>2m, Cover 10-29%, Tall shrubland	Trees<5m, Cover <10%, V low open woodland	Herbs, Cover <10%, Sparse herbland	Shrubs>2m, Cover 10-29%, Tall shrubland	Herbs, Cover 10-29%, Open herbland	Trees<5m, Cover 10-29%, V low woodland	Herbs, Cover 10-29%, Open herbland	Trees<5m, Cover 10-29%, V low woodland	Shrubs <0.25m, Cover 10-29%, Dwarf open shrubland	Shrubs 0.25–2m, Cover Shrubs 0.25–2 m, Low open shrubland	Trees<5m, Cover <10%, V low open woodland	Shrubs>2m, Cover <10%, Tall open shrubland	Shrubs>2m, Cover 10-29%, Tall shrubland
Landform element	Open depression	Hillock	Mid Slope	Flat	Open depression	Flat	Open depression	Flat	Open depression	Mid Slope	Mid Slope	Mid Slope	Upper slope	Open depression
Landform pattern	Low hill	Low hill	Low hill	Plain	Plain	Plain	Plain	Plain	Plain	Low hill	Low hill	Low hill	Low hill	Low hill
Emergent height (m)														
Tree canopy (EDL) Height (m)	6-10m	4-5m	4-5m		1-3m		4-5m		4-5m	4-5m	<1m	4-5m	4-5m	1-3m
Benchmark (count)	4-11	3-8	3-6	0	5-6	0	3-6	0	4-11	3-6	5-6	3-6	3-8	4-11
Tree richness assessment	3	1	1	0	1	0	1	0	3	1	0	1	1	1
Benchmark (count)	3-8	1-6	7-11	0-3	5-12	0-3	7-11	0-4	3-8	7-11	5-12	7-11	1-6	3-8
Shrub richness assessment	4	2	2	2	0	0	3	0	3	2	3	3	2	3
Benchmark (count)	3-13	1-7	4-12	10-14	2-6	10-14	4-12	5-16	3-13	4-12	2-6	4-12	1-7	3-13

Plot ID	RBP54	RBP55	RBP56	RBP57	RBP58	RBP59	RBP60	RBP61	RBP62	RBP63	RBP64	RBP65	RBP66	RBP67
Grass & grass-like richness assessment	2	2	5	2	2	2	2	2	3	3	3	2	2	3
Benchmark (count)	3-15	7	4-24	14-25	7-16	14-25	4-24	4-28	3-15	4-24	7-16	4-24	7	3-15
Forb and other richness assessment	5	2	10	5	5	5	5	10	5	5	10	10	5	5
Benchmark (m)	4-11	3-8	3-6	0	5-6	0	3-6	0	4-11	3-6	5-6	3-6	3-8	4-11
Tree canopy height assessment	6-10m	4-5m	4-5m		1-3m		4-5m		4-5m	4-5m		4-5m	4-5m	1-3m
Benchmark (%)	5-15	8-20	0-5	0	0-1	0	0-5	0	5-15	0-5	0-1	0-5	8-20	5-15
Tree canopy cover assessment	11-20%	0-10%	0-10%	0	11-20%	0	11-20%	0	11-20%	0	0	0-10%	0	11-20%
Benchmark (%)	0-5	5-60	20-40	0-1	0-10	0-1	20-40	0-1	0-5	20-40	0-10	20-40	5-60	0-5
Shrub canopy cover assessment	0-10%	11-20%	0-10%	0	0	0	0	0	0-10%	0	0-10%	0-10%	11-20%	0
Benchmark (count)	no data	no data	no data	na	no data	na	no data	na	no data	no data	no data	no data	no data	no data
Number of large trees Eucalypt	0	0	0		0		0		0	0	0	0	0	0
Benchmark (count)	no data	no data	no data	na	no data	na	no data	na	no data	no data	no data	no data	no data	no data
Number of large trees Non-Eucalypt	51-60	6-10	11-20		1-5		91-100		91-100	1-5	0	11-20	0	0
Benchmark (%)	no data	5-70	no data	no data	no data	no data	no data	1-30	no data	no data	no data	no data	5-70	no data
Native perennial grass cover	0-10%	0	0-10%	0	0	0	0	0	0-10%	0	11-20%	0	0	0-10%
Benchmark (%)	no data	no data	no data	no data	no data	no data	no data	4-6	no data	no data	no data	no data	no data	no data
Total litter cover	21-30%	0-10%	0-10%	0-10%	0-10%	0-10%	0-10%	0-10%	11-20%	0-10%	0-10%	11-20%	0-10%	11-20%
Rock cover	31-50%	51-80%	>80%	>80%	>80%	>80%	51-80%	51-80%	31-50%	>80%	>80%	>80%	>80%	51-80%
Bare ground cover	31-50%	21-30%	0.1	0.05	11-20%	11-20%	21-30%	21-30%	31-50%	0.1	0.1	11-20%	0.1	51-80%
Benchmark (m)	no data	no data	no data	na	10	na	no data	na	no data	no data	10	no data	no data	no data
Length of fallen logs	51-100m	1-25m	101-200m		1-25m		1-25m		1-25m	0m	0m	1-25m	1-25m	0m
Benchmark (%)	100	100	100	na	100	na	100	na	100	100	100	100	100	100
Proportion of dominant canopy (EDL) species with evidence of recruitment	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Qualitative vegetation Condition (overall)	High (>80-90% benchmark, minor disturbance)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)

BioCondition Plots RBP68 - 81

Plot ID	RBP68	RBP69	RBP70	RBP71	RBP72	RBP73	RBP74	RBP75	RBP76	RBP77	RBP78	RBP79	RBP80	RBP81
Regional Ecosystem	5.9.1	5.7.13	5.9.2	5.7.1	5.7.5	5.7.13	5.9.1	5.3.4	5.3.4	5.9.2	5.7.13	5.3.4	5.7.5	5.7.1
Habitat description (general)	Acacia eremophila shrubland on stony undulating country	Well developed Gidgee Mulga woodland on rocky drainage line	Gidgee open woodland on low to upper slopes (not crest) on rocky soils	Mulga shrubland on rocky slopes below tableland	Acacia shrubland on large silcrete boulders on crest of tableland	Well developed minni richi woodland on alluvial drainage through stony country	Eremophila Senna shrubland on rolling stony plains	Gidgee and Minni Richi on major drainage line	Minni Richi River Red Gum woodland on major drainage line	Gidgee woodland on rolling plains	Minni Richi woodland on rocky drainage	Well structured Minni Richi Gidgee River Red Gum woodland	Acacia shrubland on rocky ridge	Mulga woodland on steep rocky slopes
Vegetation Structure (Specht)	Shrubs 0.25–2m, Cover Shrubs 0.25–2 m, Low open shrubland	Trees<5m, Cover 10-29%, V low woodland	Trees<5m, Cover <10%, V low open woodland	Shrubs>2m, Cover <10%, Tall open shrubland	Shrubs 0.25–2m, Cover Shrubs 0.25–2 m, Low open shrubland	Trees 5–10m, Cover 10-29%, Low woodland	Shrubs 0.25–2m, Cover Shrubs 0.25–2 m, Low open shrubland	Trees<5m, Cover 10-29%, V low woodland	Trees 5–10m, Cover 10-29%, Low woodland	Trees<5m, Cover <10%, V low open woodland	Trees<5m, Cover 10-29%, V low woodland	Trees<5m, Cover 10-29%, V low woodland	Trees<5m, Cover 10-29%, V low woodland	
Landform element	Upper slope	Open depression	Mid Slope	Upper slope	Flat	Open depression	Mid Slope	Open depression	Open depression	Mid Slope	Open depression	Open depression	Crest	Upper slope
Landform pattern	Low hill	Low hill	Low hill	Low hill	Plateau	Plain	Plain	Alluvial plain	Alluvial plain	Low hill	Low hill	Plain	Plateau	Low hill
Emergent height (m)		6-10m												
Tree canopy (EDL) Height (m)	1-3m	4-5m	1-3m	4-5m	1-3m	6-10m	1-3m	4-5m	6-10m	4-5m	4-5m	4-5m	1-3m	4-5m
Benchmark (count)	5-6	4-11	3-6	3-8	8-10	4-11	5-6	6-12	6-12	3-6	4-11	6-12	8-10	3-8
Tree richness assessment	0	2	1	2	0	3	0	2	4	1	3	4	0	1
Benchmark (count)	5-12	3-8	7-11	1-6	7-13	3-8	5-12	5-10	5-10	7-11	3-8	5-10	7-13	1-6
Shrub richness assessment	4	5	3	3	2	3	4	3	4	1	2	4	3	4
Benchmark (count)	2-6	3-13	4-12	1-7	5-19	3-13	2-6	9	9	4-12	3-13	9	5-19	1-7
Grass & grass-like richness assessment	3	5	2	2	2	3	4	3	2	3	4	5	1	2
Benchmark (count)	7-16	3-15	4-24	7	16-27	3-15	7-16	3-9	3-9	4-24	3-15	3-9	16-27	7
Forb and other richness assessment	5	10	5	5	5	5	5	5	5	6	5	5	5	2
Benchmark (m)	5-6	4-11	3-6	3-8	8-10	4-11	5-6	6-12	6-12	3-6	4-11	6-12	8-10	3-8
Tree canopy height assessment		4-5m	1-3m	4-5m		6-10m		4-5m	6-10m	4-5m	4-5m	4-5m		4-5m
Benchmark (%)	0-1	5-15	0-5	8-20	0-1	5-15	0-1	8-20	8-20	0-5	5-15	8-20	0-1	8-20
Tree canopy cover assessment	0	11-20%	0-10%	0-10%	0	21-30%	0	11-20%	11-20%	0-10%	11-20%	11-20%	0	11-20%
Benchmark (%)	0-10	0-5	20-40	5-60	0-15	0-5	0-10	0-5	0-5	20-40	0-5	0-5	0-15	5-60
Shrub canopy cover assessment	0-10%	0-10%	0-10%	0-10%	11-20%	0-10%	0-10%	0-10%	0-10%	0	0	0	0-10%	0-10%
Benchmark (count)	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
Number of large trees Eucalypt	0	0	0	0	0	0	0	0	1-5	0	0	6-10	0	0

Plot ID	RBP68	RBP69	RBP70	RBP71	RBP72	RBP73	RBP74	RBP75	RBP76	RBP77	RBP78	RBP79	RBP80	RBP81
Benchmark (count)	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
Number of large trees Non-Eucalypt	0	91-100	31-40	6-10	0	91-100	0	71-80	91-100	11-20	31-40	71-80	0	31-40
Benchmark (%)	no data	no data	no data	5-70	5-40	no data	no data	5-30	5-30	no data	no data	5-30	5-40	5-70
Native perennial grass cover	0-10%	11-20%	0	0	0	0-10%	0	0	0-10%	0-10%	0-10%	0-10%	0	0
Benchmark (%)	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data	no data
Total litter cover	0-10%	21-30%	0-10%	0-10%	0	31-40%	0-10%	0-10%	11-20%	11-20%	11-20%	0-10%	0	0-10%
Rock cover	>80%	31-50%	>80%	>80%	51-80%	31-50%	>80%	0.1	21-30%	>80%	31-50%	31-50%	51-80%	>80%
Bare ground cover	11-20%	31-50%	0.1	11-20%	21-30%	21-30%	0.05	51-80%	51-80%	0.1	21-30%	51-80%	31-50%	11-20%
Benchmark (m)	10	no data	no data	no data	no data	no data	10	no data	no data	no data	no data	no data	no data	no data
Length of fallen logs	0m	51-100m	26-50m	1-25m	0m	101-200m	1-25m	26-50m	101-200m	1-25m	101-200m	101-200m	0m	26-50m
Benchmark (%)	100	100	100	100	100	100	100	100	100	100	100	100	100	100
Proportion of dominant canopy (EDL) species with evidence of recruitment	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Qualitative vegetation Condition (overall)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Very High (>90% benchmark, undisturbed, natural)	High (>80-90% benchmark, minor disturbance)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Very High (>90% benchmark, undisturbed, natural)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	Very High (>90% benchmark, undisturbed, natural)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	High (>80-90% benchmark, minor disturbance)	Very High (>90% benchmark, undisturbed, natural)	Low-Moderate (>30-50% benchmark, moderate disturbance, regrowth)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)

BioCondition Plots RBP82 – RBP94

Plot ID	RBP82	RBP83	RBP84	RBP85	RBP86	RBP87	RBP88	RBP89	RBP90	RBP91	RBP92	RBP93	RBP94
Regional Ecosystem	5.7.13	5.7.1	5.7.13	5.7.6	5.9.3	5.7.13	5.9.2	5.3.4	5.9.2	5.9.2	5.3.4	5.3.21	5.3.4
Habitat description (general)	Gidgee open woodland on rocky drainage lines	Mulga open woodland on rocky slopes	Mulga Gidgee woodland on drainage	Gidgee on slopes and minor drainage line	Tussock grassland on rolling stony plains	Minni Richi open woodland on drainage	Gidgee woodland on undulating stony plains	Mulga and Gidgee woodland on alluvials	Acacia oswaldii open shrubland	Gidgee on gently undulating plains	Minni Richi woodland on well developed drainage	Bare scalded floodplain	Minni Richi and Coolabah woodland on alluvials
Vegetation Structure (Specht)	Trees<5m, Cover <10%, V low open woodland	Shrubs>2m, Cover <10%, Tall open shrubland	Trees 5–10m, Cover 10-29%, Low woodland	Trees<5m, Cover 10-29%, V low woodland	Tussock grasses, Cover 10-29%, Open tussock grassland	Trees<5m, Cover <10%, V low open woodland	Trees<5m, Cover <10%, V low open woodland	Trees 5–10m, Cover 10-29%, Low woodland	Shrubs>2m, Cover <10%, Tall open shrubland	Trees<5m, Cover 10-29%, V low woodland	Trees 5–10m, Cover 10-29%, Low woodland	Trees 5–10m, Cover 10-29%, Low woodland	
Landform element	Open depression	Upper slope	Open depression	Lower slope	Mid Slope	Open depression	Open depression	Open depression	Lower slope	Mid Slope	Open depression	Flat	Open depression
Landform pattern	Low hill	Low hill	Low hill	Low hill	Low hill	Plain	Low hill	Alluvial plain	Low hill	Plain	Alluvial plain	Alluvial plain	Alluvial plain
Emergent height (m)													
Tree canopy (EDL) Height (m)	4-5m	4-5m	6-10m	4-5m		4-5m	1-3m	6-10m	1-3m	4-5m	6-10m		6-10m
Benchmark (count)	4-11	3-8	4-11	3-8	0	4-11	3-6	6-12	3-6	3-6	6-12	2-10	6-12
Tree richness assessment	2	2	2	1	0	3	1	4	2	1	3	0	3
Benchmark (count)	3-8	1-6	3-8	5-9	0-4	3-8	7-11	5-10	7-11	7-11	5-10	0-6	5-10
Shrub richness assessment	3	5	10	5	2	2	3	4	2	2	4	1	5

Plot ID	RBP82	RBP83	RBP84	RBP85	RBP86	RBP87	RBP88	RBP89	RBP90	RBP91	RBP92	RBP93	RBP94
Benchmark (count)	3-13	1-7	3-13	9-14	5-16	3-13	4-12	9	4-12	4-12	9	6-20	9
Grass & grass-like richness assessment	2	2	5	2	3	3	2	6	2	2	2	0	3
Benchmark (count)	3-15	7	3-15	12-23	4-28	3-15	4-24	3-9	4-24	4-24	3-9	6-30	3-9
Forb and other richness assessment	5	5	10	5	5	5	5	5	5	10	5	1	10
Benchmark (m)	4-11	3-8	4-11	3-8	0	4-11	3-6	6-12	3-6	3-6	6-12	2-10	6-12
Tree canopy height assessment	4-5m	4-5m	6-10m	4-5m		4-5m	1-3m	6-10m	1-3m	4-5m	6-10m		6-10m
Benchmark (%)	5-15	8-20	5-15	2-15	0	5-15	0-5	8-20	0-5	0-5	8-20	0-10	8-20
Tree canopy cover assessment	0-10%	0-10%	11-20%	11-20%	0	0-10%	0-10%	11-20%	0-10%	0-10%	21-30%	0	11-20%
Benchmark (%)	0-5	5-60	0-5	0-1	0-1	0-5	20-40	0-5	20-40	20-40	0-5	0-1	0-5
Shrub canopy cover assessment	0-10%	0-10%	11-20%	11-20%	0	0	0-10%	0-10%	0	0	0-10%	0	0-10%
Benchmark (count)	no data	no data	no data	no data	na	no data	no data	no data	no data	no data	no data	na	no data
Number of large trees Eucalypt	0	0	0	0		0	0	0	0	0	0	0	11-20
Benchmark (count)	no data	no data	no data	no data	na	no data	no data	no data	no data	no data	no data	na	no data
Number of large trees Non-Eucalypt	31-40	41-50	91-100	91-100		11-20	31-40	21-30	21-30	>100	91-100	0	71-80
Benchmark (%)	no data	5-70	no data	no data	1-30	no data	no data	5-30	no data	no data	5-30	0-15	5-30
Native perennial grass cover	0	0	11-20%	0-10%	11-20%	11-20%	0	0-10%	0	0	0	0	0
Benchmark (%)	no data	no data	no data	no data	4-6	no data	no data	no data	no data	no data	no data	0-1	no data
Total litter cover	0	0-10%	11-20%	11-20%	0-10%	0-10%	0-10%	0-10%	0-10%	0-10%	11-20%	0	21-30%
Rock cover	51-80%	>80%	11-20%	51-80%	51-80%	51-80%	>80%	21-30%	>80%	>80%	21-30%	21-30%	0
Bare ground cover	31-50%	11-20%	21-30%	21-30%	31-50%	31-50%	0.1	51-80%	11-20%	0.1	51-80%	51-80%	51-80%
Benchmark (m)	no data	no data	no data	no data	na	no data	no data	no data	no data	no data	no data	na	no data
Length of fallen logs	51-100m	1-25m	26-50m	26-50m		51-100m	26-50m	51-100m	1-25m	101-200m	201-300m	0m	201-300m
Benchmark (%)	100	100	100	100	na	100	100	100	100	100	100	na	100
Proportion of dominant canopy (EDL) species with evidence of recruitment	0	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Qualitative vegetation Condition (overall)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Very High (>90% benchmark, undisturbed, natural)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	High (>80-90% benchmark, minor disturbance)	High (>80-90% benchmark, minor disturbance)	Moderate (>50-70% benchmark, moderate disturbance, mature regrowth)	Moderate-High (>70-80% benchmark, moderate disturbance, recovering well)

Appendix D – Flora species list

Table 22: Flora species list

Family	Species	Common Name	Growth Form Group
Malvaceae	*Abutilon leucopetalum*		Shrub (SG)
Fabaceae (Mimosoideae)	*Acacia aneura* var. *aneura*	Mulga	Shrub (SG)
Fabaceae (Mimosoideae)	*Acacia cambagei*	Gidgee	Tree (TG)
Fabaceae (Mimosoideae)	*Acacia cyperophylla* var. *cyperophylla*	Mineritchie	Tree (TG)
Fabaceae (Mimosoideae)	*Acacia oswaldii*	Miljee	Tree (TG)
Fabaceae (Mimosoideae)	*Acacia sibirica*	Bastard Mulga	Shrub (SG)
Fabaceae (Mimosoideae)	*Acacia* sp.	Wattle	Shrub (SG)
Fabaceae (Mimosoideae)	*Acacia tetragonophylla*	Dead Finish	Shrub (SG)
Capparaceae	*Apophyllum anomalum*	Warrior Bush	Shrub (SG)
Poaceae	*Aristida contorta*	Bunched Kerosene Grass	Grass & grasslike (GG)
Poaceae	*Aristida* sp.	A Wiregrass	Grass & grasslike (GG)
Poaceae	*Astrebla pectinata*	Barley Mitchell Grass	Grass & grasslike (GG)
Sapindaceae	*Atalaya hemiglauca*	Whitewood	Tree (TG)
Chenopodiaceae	*Atriplex* sp.	A Saltbush	Shrub (SG)
Capparaceae	*Capparis mitchellii*	Native Orange	Shrub (SG)
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*	Rock Fern	Fern (EG)
Poaceae	*Chloris pectinata*	Comb Chloris	Grass & grasslike (GG)
Myrtaceae	*Corymbia terminalis*		Tree (TG)
Apocynaceae	*Cynanchum viminale* subsp. *australe*	Caustic Vine	Other (OG)
Poaceae	*Dactyloctenium radulans*	Button Grass	Grass & grasslike (GG)
Poaceae	*Digitaria* sp.	A Finger Grass	Grass & grasslike (GG)
Acanthaceae	*Dipteracanthus australasicus* subsp. *australasicus*		Shrub (SG)
Sapindaceae	*Dodonaea viscosa* subsp. *spatulata*	Broad-leaf Hopbush	Shrub (SG)
Chenopodiaceae	*Enchylaena tomentosa*	Ruby Saltbush	Shrub (SG)
Poaceae	*Enneapogon polyphyllus*	Leafy Nineawn	Grass & grasslike (GG)
Poaceae	*Enneapogon* sp.	Nineawn Grass, Bottlewashers	Grass & grasslike (GG)

Family	Species	Common Name	Growth Form Group
Poaceae	*Enteropogon acicularis*	Curly Windmill Grass	Grass & grasslike (GG)
Myoporaceae	*Eremophila latrobei* subsp. *glabra*		Shrub (SG)
Myoporaceae	*Eremophila latrobei* subsp. *latrobei*		Shrub (SG)
Myoporaceae	*Eremophila* sp.		Shrub (SG)
Myrtaceae	*Eucalyptus camaldulensis* subsp. *arida*		Tree (TG)
Myrtaceae	*Eucalyptus coolabah*	Coolibah	Tree (TG)
Euphorbiaceae	*Euphorbia tannensis*		Shrub (SG)
Aizoaceae	*Glinus lotoides*	Hairy Carpet-weed	Forb (FG)
Proteaceae	*Grevillea striata*	Beefwood	Tree (TG)
Poaceae	*Iseilema* sp.		Grass & grasslike (GG)
Brassicaceae	*Lepidium phlebopetalum*	Veined Peppercress	Forb (FG)
Chenopodiaceae	*Maireana georgei*	Slit-wing Bluebush	Shrub (SG)
Chenopodiaceae	*Maireana* sp.	Cotton Bush, Bluebush, Fissure-weed	Shrub (SG)
Marsileaceae	*Marsilea drummondii*	Common Nardoo	Fern (EG)
Chenopodiaceae	*Neobassia proceriflora*	Soda Bush	Shrub (SG)
Meliaceae	*Owenia acidula*	Emu Apple	Tree (TG)
Poaceae	*Paspalidium* sp.		Grass & grasslike (GG)
Portulacaceae	*Portulaca oleracea*	Pigweed	Forb (FG)
Amaranthaceae	*Ptilotus* sp.		Forb (FG)
Chenopodiaceae	*Salsola australis*		Shrub (SG)
Santalaceae	*Santalum lanceolatum*	Northern Sandalwood	Shrub (SG)
Goodeniaceae	*Scaevola spinescens*		Shrub (SG)
Chenopodiaceae	*Sclerolaena bicornis* var. *bicornis*		Shrub (SG)
Chenopodiaceae	*Sclerolaena eriacantha*	Silky Copperburr	Shrub (SG)
Chenopodiaceae	*Sclerolaena longicuspis*		Shrub (SG)
Chenopodiaceae	*Sclerolaena tricuspis*	Giant Redburr	Shrub (SG)
Fabaceae (Caesalpinioideae)	*Senna artemisioides* subsp. *helmsii*		Shrub (SG)
Fabaceae (Caesalpinioideae)	*Senna artemisioides* subsp. *oligophylla*		Shrub (SG)
Fabaceae (Caesalpinioideae)	*Senna phyllodinea*		Shrub (SG)
Solanaceae	*Solanum* sp.		Forb (FG)
Poaceae	*Sporobolus actinocladus*	Katoora Grass	Grass & grasslike (GG)
Chenopodiaceae	*Tecticornia* sp.		Shrub (SG)

Family	Species	Common Name	Growth Form Group
Poaceae	*Themeda triandra*	Kangaroo Grass	Grass & grasslike (GG)
Rhamnaceae	*Ventilago viminalis*	Supple Jack	Tree (TG)
Zygophyllaceae	*Zygophyllum* sp.		Forb (FG)

Appendix E – Fauna species list

Table 23: Fauna species list

Common Name	Species Name	Record
Birds		
Australian Magpie	*Gymnorhina tibicen*	Observed
Australian Raven	*Corvus coronoides*	Observed
Blue Bonnet	*Northiella haematogaster*	Observed
Bourke's Parrot	*Neopsephotus bourkii*	Observed
Budgerigar	*Melopsittacus undulatus*	Observed
Cinnamon Quail-thrush	*Cinclosoma cinnamomeum*	Observed
Crested Pigeon	*Ocyphaps lophotes*	Observed
Eastern Barn Owl	*Tyto javanica* (syn. *Tyto alba*)	Pellets
Masked Woodswallow	*Artamus personatus*	Observed
Nankeen Kestrel	*Falco cenchroides*	Observed
Variegated Fairy-wren	*Malurus lamberti*	Observed
Wedge-tailed Eagle	*Aquila audax*	Remote Camera
Whistling Kite	*Haliastur sphenurus*	Heard
White-breasted Woodswallow	*Artamus leucorynchus*	Observed
White-winged Fairy-wren	*Malurus leucopterus*	Observed
Willie Wagtail	*Rhipidura leucophrys*	Observed
Zebra Finch	*Taeniopygia guttata*	Observed
Mammals		
Cow	*Bos taurus*	Scats
European Fox	*Vulpes vulpes*	Tracks
Long-haired Rat	*Rattus villosissimus*	Bones
Microbats (unknown species)		Scats and roosting cave
Unidentified Dasyurid	?*Ningaui ridei*, *Planigale ingami* or *Planigale tenuirostris*	Bones
Western Grey Kangaroo	*Macropus fuliginosus*	Observed
Wongai ningaui	*Ningaui ridei*	

Appendix F – Significant Impact Assessments

A significant impact assessment has been prepared for all MNES and MSES identified within the study area as potentially occurring. These MNES occurring in the Project area are limited to threatened species known or potentially occurring.

This assessment has been undertaken in accordance with the EPBC Act Significant Impact Guidelines 1.1 (DoE, 2013) for MNES and the Significant Residual Impact Guidelines (EHP 2014) for MSES.

In the absence of species-specific policy guidelines or recovery plans, the definitions from the Significant Impact Guidelines (DoE, 2013) for 'population of a species', 'important population', and 'habitat critical for the survival of the species' were applied to vulnerable threatened species impact assessments. These are presented below.

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- *a geographically distinct regional population, or collection of local populations, or*
- *a population, or collection of local populations, that occurs within a particular bioregion.*

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.*

Habitat critical to the survival of a species refers to areas that are necessary:

- *for activities such as foraging, breeding, roosting, or dispersal*
- *for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)*
- *to maintain genetic diversity and long-term evolutionary development, or*
- *for the reintroduction of populations or recovery of the species or ecological community. Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.*

5.1.1 Grey Falcon (*Falco hypoleucos*) – potential impacts and significance assessment

The project will result in direct impacts of up to 64 ha of vegetation considered to be potential foraging habitat for Grey Falcon. No breeding places were identified within the study area during the field surveys, however, given the species persistence in the region (observed approx. 30 km south from the study area during August 2021), breeding may occur within the study area and surrounds. Foraging habitat within the study area includes a range of treed and tree-less habitat, with potential breeding habitat limited to areas along watercourses where taller trees occur, and nesting sites may exist.

Appropriate mitigation and management measures such as clear demarcation of sensitive vegetation, use of sensitive clearing techniques and progressive rehabilitation are likely to prevent any other indirect impacts occurring.

In consideration of the Significant Residual Impact Guidelines (EHP 2014) for protected wildlife habitat, the Significant Impact Guidelines 1.1 (DotE 2013) for MNES and the proposed scope of works, impacts to Grey Falcon are unlikely to be significant (**Table 24**).

Table 24: Grey Falcon significant impact assessment

Criteria	Response to criteria
Lead to a long-term decrease in the size of an important population of a species OR Lead to a long-term decrease in the size of a local population	The Grey Falcon occurs in arid and semi-arid Australia and occurs at low densities within this inland environment. It is a wide ranging, mobile species. Grey Falcon habitat within the study area is considered to represent mostly potential foraging habitat, with potential breeding habitat limited to taller trees along watercourses (such as Acacia woodlands habitat type). Given the lack of species observations within the study area, and the majority of the study area comprising only foraging habitat, it is unlikely an important population of Grey Falcon occurs in the study area. The project will directly impact up to 64 ha of foraging habitat. Direct impacts of the proposed development are unlikely to inhibit breeding or movement of the Grey Falcon and is unlikely to lead to a long-term decrease in the size of an important population or size of a local population.
Reduce the area of occupancy of an important population OR Reduce the extent of occurrence of the species	The extent of occurrence (EOO) is estimated at 6.1 million km^2, and the area of occupancy (AOO) estimated at 6,000 km2 (Garnett et al. 2011). Direct impacts up to 64 ha of potential habitat will not inhibit breeding or movement of the species, and therefore is unlikely to reduce the AOO or EOO of the species.
Fragment an existing important population into two or more populations	Direct impacts up to 64 ha of potential foraging habitat is likely to be predominantly linear in nature (e.g. access tracks, pipeline right of ways) and minor areas of clearing for well pads. An important population of the species is unlikely to occur (as per the above). This species is highly mobile and wide ranging, therefore, the proposed development is unlikely to fragment an existing population into two or more populations.
Adversely affect habitat critical to the survival of the species	No habitat critical to the survival of the species is defined for Grey Falcon. Whilst potential habitat for the species may be present in the form of potential foraging and breeding habitat, the habitat present in the study area is typical of that in the surrounding landscape and is unlikely to be necessary for the long-term maintenance of the species, or to maintain genetic diversity or for the reintroduction of populations. As such, habitat within the study area is unlikely to be habitat critical to the survival of the Grey Falcon. The proposed development will directly impact up to 64 ha of potential foraging habitat, which is a small amount of habitat available within the study area and surrounding region. In consideration of these facts, the proposed development is not considered to adversely affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population OR	The proposed development will directly impact up to 64 ha of potential foraging habitat, which is a small amount of habitat available within the study area and surrounding region. An important population or ecologically

Criteria	Response to criteria
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	significant locations for Grey Falcon is unlikely to occur. Therefore, the proposed development is unlikely to disrupt to the breeding cycle of an important population or disrupt an ecological significant location. To minimise potential impacts to individuals, mitigations outlined in **Section 5** are recommended.
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline OR Result in genetically distinct populations forming as a result of habitat isolation	The proposed development will directly impact up to 64 ha of potential foraging habitat only. Whilst the area of potential habitat will decrease within the study area, the extent is negligible considering the wide ranging and mobile nature of the species. Appropriate management practises will be implemented during the proposed development to reduce the risk of habitat degradation of surrounding areas. The proposed development is unlikely to impact habitat to the extent that the species is likely to decline or be isolated given the nature of the proposed impact and the species' mobile nature.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented, to minimise the risk of introduction or spread of weed species. Pest species that are harmful to the species (e.g. feral cats and foxes) are already known from the region and the proposed development is unlikely to increase the risk of harm from pest species.
Introduce disease that may cause the species to decline	It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (*Phytophthora cinnamomi*).
Interfere substantially with the recovery of the species	There is no Recovery Plan for this species. Considering the wide ranging and mobile nature of the species and that the habitat impacted is negligible in regard to the available habitat in the surrounding landscape, the proposed development is not considered to substantially interfere with the recovery of the species.

5.1.2 Major Mitchell's Cockatoo (*Lophochroa leadbeateri*) – potential impacts and significance assessment

The proposed development will result in direct impacts up to 64 ha of vegetation considered to be potential habitat for Major Mitchells' Cockatoo. The species inhabits a wide range of treed and treeless inland habitats, however these areas are always within a close distance to water. Foraging habitat within the study area consists of both these habitats (especially saltbush and Acacia habitats), with potential breeding habitat limited to trees capable of hosting tree hollows in which they nest.

Appropriate mitigation and management measures such as clear demarcation of sensitive vegetation, use of sensitive clearing techniques and progressive rehabilitation are likely to prevent any other indirect impacts occurring.

In consideration of the Significant Residual Impact Guidelines (EHP 2014) for protected wildlife habitat and the proposed scope of works, impacts to Major Mitchell Cockatoo are unlikely to be significant (**Table 25**).

Table 25: Major Mitchell's Cockatoo significant impact assessment

Criteria	Response to criteria
Lead to a long-term decrease in the size of a local population	No observations of the species were made in the study area, however, several species records occur within the region, including a relatively recent record (2014) within 25 km of the study area.

Criteria	Response to criteria
	The proposed development will directly impact up to 64 ha of potential habitat. This is a wide ranging and mobile species recorded across much of inland Australia. Direct impacts of the proposed development are unlikely to inhibit breeding or movement of the Major Mitchell's Cockatoo and is unlikely to lead to a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species	The species is wide ranging and mobile, recorded across much of inland Australia. Direct impacts up to 64 ha of potential habitat is relatively small and is unlikely to inhibit breeding or movement of the species, and therefore is unlikely to reduce the EOO of the species.
Fragment an existing population	Direct impacts up to 64 ha of potential habitat is likely to be predominantly linear in nature (e.g. access tracks, pipeline right of ways) and minor areas of clearing for well pads. This species is highly mobile and wide ranging, therefore, the proposed development is unlikely to fragment an existing population into two or more populations.
Result in genetically distinct populations forming as a result of habitat isolation	The proposed development will directly impact up to 64 ha of potential habitat. Whilst the area of habitat will decrease within the study area, the extent is negligible considering the wide ranging and mobile nature of the species. Impacts from habitat fragmentation to the species would be minimal. Appropriate management practises will be implemented during the proposed development to reduce the risk of habitat degradation of surrounding areas. The proposed development is unlikely to impact habitat to the extent that distinct populations would form as a result of habitat isolation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented, to minimise the risk of introduction or spread of weed species. Pest species that are harmful to the species (e.g. feral cats and foxes) are already known from the region and the proposed development is unlikely to increase the risk of harm from pest species.
Introduce disease that may cause the species to decline	It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (*Phytophthora cinnamomi*).
Interfere with the recovery of the species	There is a Recovery Plan for this species. Considering the wide ranging and mobile nature of the species, and that the habitat impacted is negligible in regards to the available habitat in the surrounding landscape, the proposed development is not considered to substantially interfere with the recovery of the species.
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	The proposed development will directly impact up to 64 ha of potential habitat. Potential foraging habitat within the study area is widespread, whilst potential breeding habitat is limited to watercourses that are more likely to host taller trees capable of forming hollow bearing trees in which individuals may nest. Appropriate mitigation measures will be implemented to minimise potential disruptions to individuals. Therefore, the proposed development is unlikely to ecological significant locations given these measures and the varsity of similar habitat in the landscape.

5.1.3 Painted Honeyeater (*Grantiella picta*) – potential impacts and significance assessment

The project will result in direct impacts of up to 64 ha of vegetation considered to be potential habitat for Painted Honeyeater. Potential habitat present is limited to creek lines and nearby *Acacia* dominated woodlands that may host mistletoe. The closest known record is approximately 25 south-east (ALA, 2021) of the study area.

Appropriate mitigation and management measures such as clear demarcation of sensitive vegetation, use of sensitive clearing techniques and progressive rehabilitation are likely to prevent any other indirect impacts occurring.

In consideration of the Significant Residual Impact Guidelines (EHP 2014) for protected wildlife habitat, the Significant Impact Guidelines 1.1 (DotE 2013) for MNES and the proposed scope of works, impacts to Painted Honeyeater are unlikely to be significant (**Table 26**).

Table 26: Painted Honeyeater significant impact assessment

Criteria	Response to criteria
Lead to a long-term decrease in the size of an important population of a species OR Lead to a long-term decrease in the size of a local population	The species is a mistletoe specialist and relies on this food source in the landscape. It is a widespread, nomadic species responding to flowering mistletoe events, thus its presence in the study area only being occasional. The species is often only observed singly or in pairs or small flocks. Given the infrequency of mistletoe observed in the study area, it is unlikely an important population of Painted Honeyeater inhabits the study area. Further, given the relatively small impact area (up to 64 ha) and the context of the species being widespread with records concentrated around areas likely to contain mistletoe host trees (i.e. Coolabah within the Cooper Creek floodplain), it is unlikely the proposed development will lead to a long-term decrease in the size of a population at a local or regional level.
Reduce the area of occupancy of an important population OR Reduce the extent of occurrence of the species	Given the above, it is unlikely an important population of Painted Honeyeater occurs in the study area. Further, the EOO is estimated to be 2 800 000 km^2 and the AOO is estimated to be 1 000 km^2 (Garnett et al., 2011), therefore, the relatively small impacts of up to 64 ha is unlikely to reduce either of these.
Fragment an existing important population into two or more populations	An important population of Painted Honeyeater is unlikely to occur within the study area given the sparsity of mistletoe observed on which the species relies. It is therefore unlikely project impacts of up to 64 ha of potential species habitat would fragment an existing population of this wide-ranging and mobile species.
Adversely affect habitat critical to the survival of the species	The species is a mistletoe specialist and almost entirely relies on this food source for survival. Given the scarcity of mistletoe observed in the study area, it is unlikely that habitat critical to the survival of the species occurs in the study area. Therefore, it is unlikely that the project would adversely affect habitat critical to the survival of the species given its absence of this form of habitat in the study area.
Disrupt the breeding cycle of an important population OR Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	An important population of Painted Honeyeater is unlikely to occur within the study area given the sparsity of mistletoe observed on which the species relies. Project development should actively avoid areas of mistletoe observed to mitigate potential impacts on the species food resource. Given these measures and the small area of proposed impact (up to 64 ha), it is unlikely that impacts will disrupt the breeding cycle or cause disruption to ecologically significant locations of the species.

Criteria	Response to criteria
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline OR Result in genetically distinct populations forming as a result of habitat isolation	The species is mobile and wide ranging. Habitat throughout the study area is sparse and limited to infrequent areas hosting mistletoe. Given the small impacts proposed, and these mostly being of a linear nature, it is unlikely impacts would modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, nor would it result in a genetically distinct population forming as result of habitat isolation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented, to minimise the risk of introduction or spread of weed species. Pest species that are harmful to the species (e.g. feral cats and foxes) are already known from the region and the proposed development is unlikely to increase the risk of harm from pest species.
Introduce disease that may cause the species to decline	It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (*Phytophthora cinnamomi*).
Interfere substantially with the recovery of the species	There is no Recovery Plan for this species. Considering the wide ranging and mobile nature of the species and that the habitat impacted is negligible in regard to the available habitat in the surrounding landscape, the proposed development is not considered to substantially interfere with the recovery of the species.

5.1.4 *Indigofera oxyrachis* – potential impacts and impact assessment

The proposed development will result in direct impacts up to 64 ha of vegetation considered to be potential habitat for the plant. Closest known records of *I. oxyrachis* are 50 to 60 km to the north east of the study area, however, occur in similar environments to those within the study area. Queensland herbarium identifies specimens being recorded on stony rises on cracking clay soils and in open areas amongst low gidgee woodland, with *Senna artemisioides* and *Senna phyllodinea* present. It has also been recorded on open scalded creek flats at the base of escarpments, in open mixed woodland on light clay and sandy creek lines throughout stony patches. These types of habitats are widespread in the region, but the occurrence of *I. oxyrachis* is not.

Appropriate mitigation and management measures such as clear demarcation of sensitive vegetation, use of sensitive clearing techniques and progressive rehabilitation are likely to prevent any other indirect impacts occurring.

In consideration of the Significant Residual Impact Guidelines (EHP 2014) for protected wildlife habitat and the proposed scope of works, impacts to *I. oxyrachis* are unlikely to be significant (**Table 27**).

Table 27: *Indigofera oxyrachis* significant impact assessment

Criteria	Response to criteria
Lead to a long-term decrease in the size of a local population	No populations of the species were observed and impacts of potential habitat should the species occur in the study area would be minor. Given this, it is unlikely the project would lead to a long-term decrease in the size of a local population.
Reduce the extent of occurrence of the species	Known populations of the species extend from Idalia National Park to Cooper Creek. These areas are east of the study area, though potential habitat and potential occurrence of the species extends west within the surrounding the study area. Given no populations were observed, and the

Criteria	Response to criteria
	species known EOO and potential EOO exists surrounding the region, it is unlikely small impacts of potential species habitat would impact the species EOO. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible.
Fragment an existing population	No existing populations are known to occur within the study area, rather potential occurrence of the species due to presence of species habitat. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible. As such, it is unlikely the project would fragment an existing population.
Result in genetically distinct populations forming as a result of habitat isolation	Species habitat is known to occur east of Cooper Creek, with potential species habitat occurring west and extending into the study area. No populations were observed. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible. As such, it is unlikely the project would result in genetically distinct populations forming as result of habitat isolation.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	Limited invasive weed species are known from the surrounding area. Appropriate vehicle hygiene procedures will be implemented to minimise the risk of introduction or spread of weed species. It is unlikely the proposed development would increase the risk of harm from invasive species.
Introduce disease that may cause the species to decline	It is unlikely that the proposed development will facilitate the introduction or spread of diseases specific to the species, or diseases that can significantly degrade habitat such as root rot (*Phytophthora cinnamomi*).
Interfere with the recovery of the species	There is a Recovery Plan for this species. No populations of the species were observed and impacts of potential habitat should the species occur in the study area would be minor. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible. As such, it is unlikely the project would interfere with the recovery of the species.
Cause disruption to ecologically significant locations (breeding, feeding, nesting, migration or resting sites) of a species.	*Indigofera* reproduces through pollination of flowers. Mitigation measures should be implemented in which if the species is detected, avoidance measures should occur, where possible. It is unlikely that project impacts would cause a disruption to the ecologically significant locations, should they be identified. Pollination mechanisms within the region would still be occurring.

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