BIODIVERSITY DEVELOPMENT ASSESSMENT REPORT

Cully's Corner Gypsum Mine

October 2021

Project Number: 19-218

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ACRONYMS AND ABBREVIATIONS

BAM	Biodiversity Assessment Methodology
BAM-C	BAM Calculator
BC Act	Biodiversity Conservation Act 2016 (NSW)
BCD	Biodiversity Conservation Division (BCD)
BDAR	Biodiversity Development Assessment Report
BOM	Australian Bureau of Meteorology
BOS	Biodiversity Offsets Scheme (NSW)
CEEC	Critically Endangered Ecological Community
DBH	Diameter at Breast Height
DPE	(NSW) Department of Planning and Environment (Now DPIE)
DPIE	(NSW) Department of Planning, Industry and Environment (Formerly DPE)
EEC	Endangered Ecological Community
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EIS	Environmental Impact Statement
GIS	Geographic Information System
ha	hectares
HBT	Hollow-bearing Tree
IBRA	Interim Biogeographic Regionalisation of Australia
km	kilometres
m	Metres
MNES	Matters of National environmental significance under the EPBC Act (*c.f.*)
NSW	New South Wales
OEH	Formerly Office of Environment and Heritage (NSW) now BCD
SEARS	Secretary's Environmental Assessment Requirements
SAII	Serious and Irreversible Impact
SEPP	State Environmental Planning Policy (NSW)
sp/spp	Species/multiple species
TEC	Threatened Ecological Community

EXECUTIVE SUMMARY

NGH has prepared this Biodiversity Development Assessment Report (BDAR) on behalf of Balranald Gypsum. The proponent is planning for the construction and operation of a shallow open cut mine for the extraction of up to 40 000 tonnes of Gypsum per annum over 10 years.

The clearing of native vegetation for the proposal exceeds the Biodiversity Offset Scheme (BOS) area thresholds listed under Cl 7.2 of the *Biodiversity Conservation Act 2016* (BC Act). Thus, in accordance with the BC Act, a BDAR must be prepared using the Biodiversity Assessment Methodology (BAM) 2020. This report follows the field work methodologies and assessment format required by the BAM.

Two Plant Community Types (PCTS) were identified within the development site. These are;

- PCT 170: *Chenopod Sandplain Mallee Woodland/shrubland of the arid and semi-arid (warm) zones.*
- PCT 171: *Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion*

PCTS were stratified into five zones of varying broad condition from woodland areas to partially cleared and disturbed areas lacking any overstory vegetation. Eleven Vegetation Integrity plots were undertaken throughout the five zones to determine the vegetation integrity score (VIS) for each zone.

Consideration has been given to avoiding and minimising impacts to biodiversity throughout each phase of the proposal. Proposal design has been modified to reduce impacts to better quality and remnant vegetation within the development site. The majority of the extraction area occurs on previously disturbed and cleared vegetation.

For impacts unable to be avoided, the proposal requires the removal of 11.24 ha of PCT 170: *Chenopod Sandplain Mallee Woodland/shrubland of the arid and semi-arid (warm) zones* and 0.62 ha of PCT 171: *Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion.* 6.07 ha of this clearing occurred in vegetation that was sufficiently degraded with a vegetation integrity score less than 20 and did not require further assessment.

Twenty six threatened species credit species were predicted to occur within the development site from the BAM Calculator. Targeted surveys were undertaken for these species, but none were detected within the development site. One threatened flora species, Greenhood Orchid (*Pterostylis cobarensis*) was unable to be surveyed for due to unfavourable seasonal conditions for this species. For the purposes of the BAM assessment it has been assumed to occur within the development site.

Impacts to federally listed species have been considered and an assessment of significance was undertaken for three vulnerable listed species, the Grey Falcon, Mallee Fowl and Corben's Long-eared Bat. Potential impacts are considered unlikely to be significant and no referral is considered necessary to the Federal Department of Agriculture, Water and the Environment.

The final offset credit requirements for the proposal are;

- 107 Ecosystem credits for impacts to PCT 170: *Chenopod Sandplain Mallee Woodland/shrubland of the arid and semi-arid (warm) zones,*
- 15 Ecosystem credits for impacts to PCT 171: *Spinifex linear dune Mallee mainly of the Murray Darling Depression Bioregion* and,
- 163 Species credits for assumed impacts to Greenhood Orchid (*Pterostylis corbarensis*)

The retirement of the credits generated will be carried out in accordance with the NSW Biodiversity Offsets Scheme under the BC Act. With the retirement of credits and effective implementation of mitigation measures, the proposal is consistent with the requirements of the BAM.

1 INTRODUCTION

The Cully's Corner Gypsum Mine proposal is classified as Designated Development under Part 4 of the Environmental Planning and Assessment Act (EPA Act). Clearing of native vegetation as part of this proposal exceeds the BOS area thresholds listed under Cl7.2 of the Biodiversity Conservation Act regulations and in accordance with the Biodiversity Conservation Act 2016 (BC Act), a Biodiversity Development Assessment Report (BDAR) must be prepared.

This BDAR assesses the impacts of the proposed Cully's Corner Gypsum Mine (the proposal) according to the NSW Biodiversity Assessment Methodology 2020 (BAM).

The following terms are used in this document:

- **Development footprint** – The area of land that is directly impacted on by the proposal. The development footprint is approximately 14.23 ha and includes the mining extraction area, site office amenities and vehicle storage and the upgrade of access roads.
- **Development site** – The area of land that is subject to a proposed development. The development site is approximately 28.3 ha. The development site is the area surveyed for this assessment.
- **Subject land** – The combined areas of the development site and development footprint, and an area where Stage 1 of the BAM has been applied. The Subject Land is the same as the Development Site for this assessment.
- **Locality**– All land within 1500 m of the outside edge of the boundary of the development site

1.1 THE PROPOSAL

The Cully's Corner Gypsum Mine proposal would comprise the operation of a shallow open cut mine with an intended extraction capacity of between 100,000 tonnes and 180 000 tonnes per annum over 10 years. Balranald Gypsum Pty Ltd proposes to utilise 11.27 ha of the development site for the mining extraction area, retaining existing viable native vegetation remnants that occur on the development site.

The gypsum is proposed to be extracted to a maximum depth of 5 metres using the open cut method (strip-mining approach). It would then be screened through an onsite screening plant and stockpiled for direct loading onto B Double trucks, road trains and transported via the surrounding public roads network. The operation would consist of excavators, trucks, mobile screening plant, site office and amenities, hydrocarbon storage facility and haul roads. The proposal would include the following elements:

- Shallow open cut mine for Gypsum extraction
- Mobile screening plant
- Site offices and amenities
- Hydrocarbon storage facility
- Upgrade of haulage roads

The expected mine life is up to 10 years with rehabilitation undertaken in stages immediately after final extraction, using the original topsoil Upon closure, the site would be returned to its former use as a TSR, predominantly for livestock grazing.

1.2 THE DEVELOPMENT SITE

1.2.1 Site location

The proposed location of the Cully's Corner Gypsum Mine is in the Balranald Local Government Area (LGA) around 8 km north of Balranald as shown in Figure 1-1. The development site is at 881 Ivanhoe Road, Balranald, formally identified as Lot 6655 DP 769428 and encompasses 370 ha (Figure 1-1). The development site comprises approximately 28.3 ha of Lot 6655 DP 769428 as well as the access track joining the development site to Ivanhoe Road. The land is Crown Land, dedicated as a Travelling Stock Reserve (TSR).

1.2.2 Site description

The development site is located within the Balranald Local Government Area. It is accessed from Ivanhoe Road, approximately 300 m east of the development site. Ivanhoe Road is adjacent to and runs east along the length of Lot 6655 DP 769428 (Figure 1-1). The development site is located within land zoned RU1 Primary Production under the Balranald Local Environmental Plan (LEP) 2010.

The development site is relatively flat and the majority of the site is currently comprised of Semi-arid Mallee Woodland. Previous disturbance from past gypsum mining has left some areas cleared and left to regenerate into a shrubland. There is also a high disturbance from recreational vehicle use with many unofficial vehicle tracks throughout.

The proposal is located within the South Olary Plain Interim Biogeographic Regionalisation of Australia (IBRA) subregion of the Murray Darling Depression IBRA. The main vegetation types identified were Dune Mallee Woodlands, Inland Floodplain Woodlands, Inland Riverine Forests, Sand Plain Mallee Woodlands, Semi-arid Sand Plain Woodlands and non-native vegetation within 1.5 km of the development site.

The Murrumbidgee River is located around 6 – 8 km from the south through to eastern side of the development site. Yanga National Park is located around 6 km east of the development site. Yanga National Park is adjacent to the Murrumbidgee River and is known for fishing, camping and a high number of wildlife, especially birds. Although Yanga National park is one of the state's newest, it boasts a long and significant Aboriginal history (NSW NPWS, 2019).

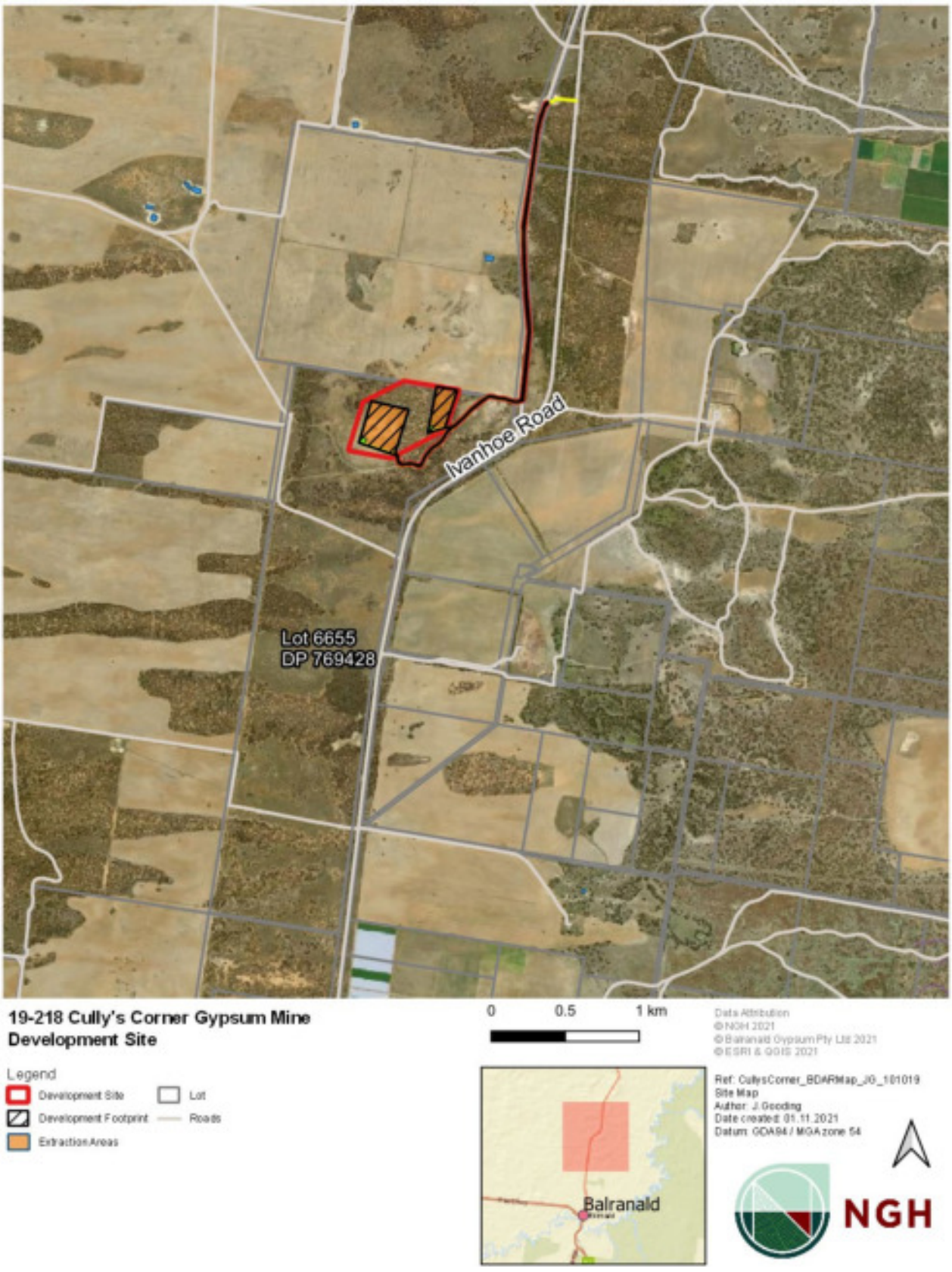


Figure 1-1 Site Map

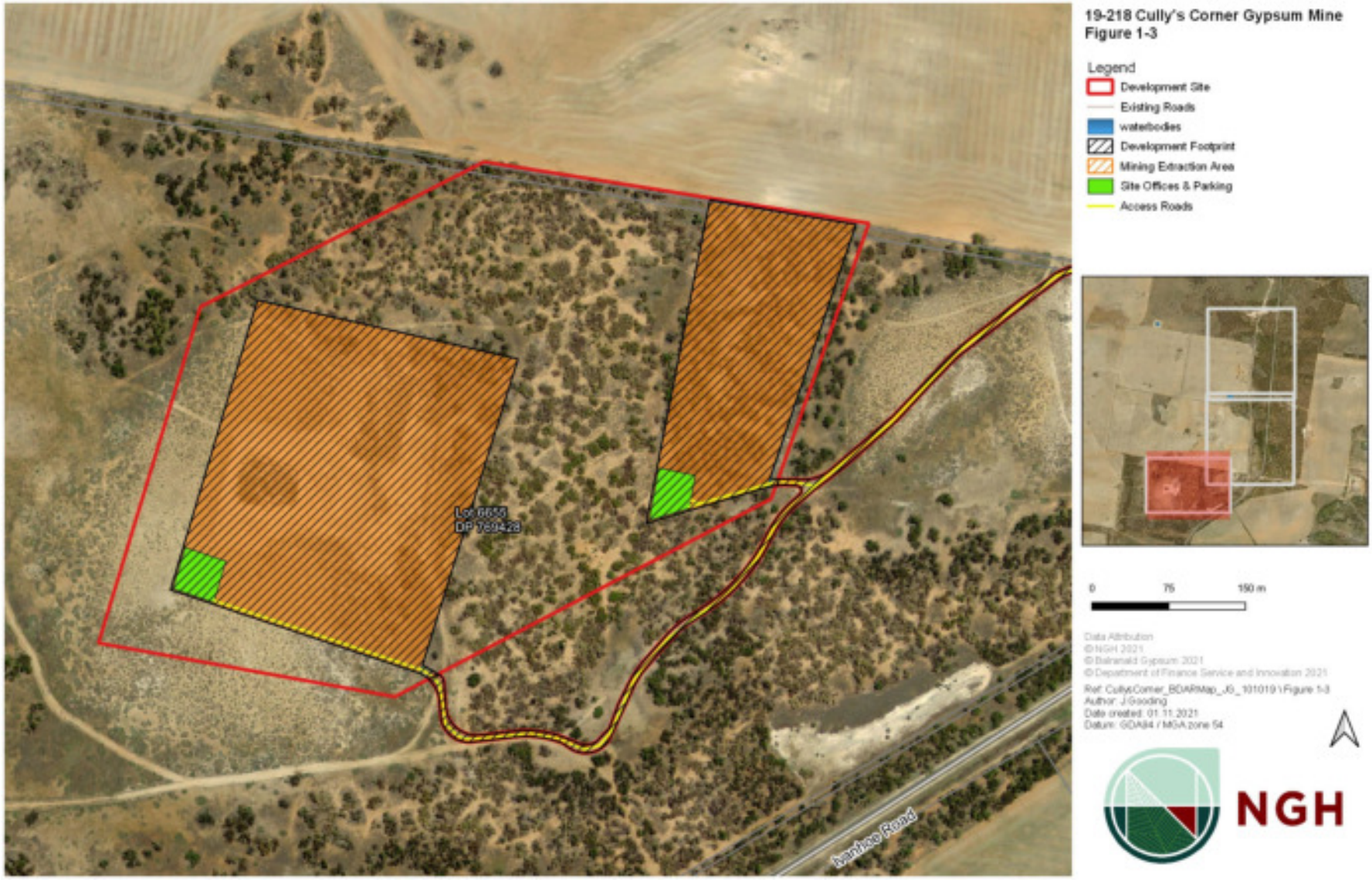


Figure 1-2 Site Map Inset A

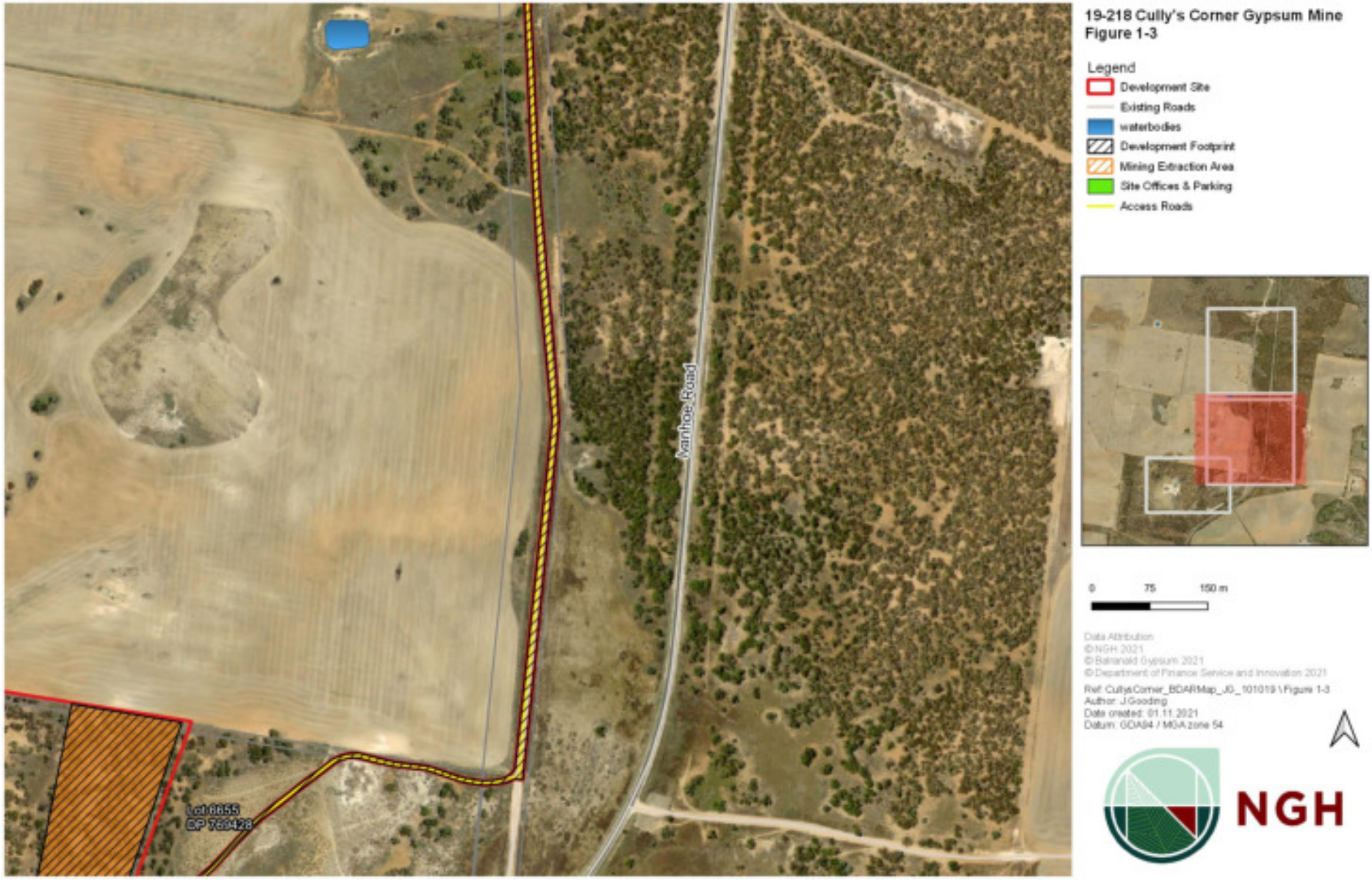


Figure 1-3: Site Map Inset B

Figure 1-4 Site Map Inset C

1.3 STUDY AIMS

This BDAR has been prepared by NGH on behalf of Balranald Gypsum Pty Ltd.

The aim of this BDAR is to address the requirements of the Biodiversity Conservation Act 2016 and the Biodiversity Assessment Methodology (BAM), as required in the Secretary's Environmental Assessment Requirements (SEARs) and summarised below.

Table 1-1 SEARS requirements

Secretary's Environmental Assessment Requirement	Where addressed
The EIS must address the following specific issues: - **Biodiversity** – Including: - accurate predictions of any vegetation clearing on site, including the location and amount of clearing and types of species affected; - consideration of the potential biodiversity impacts of the development, paying particular attention to threatened species, populations and ecological communities and groundwater dependent ecosystems undertaken in accordance with Sections 7.2 and 7.7 of the Biodiversity Conservation Act 2016, and having regard to OEH; and - a detailed description of the proposed measures to maintain or improve the biodiversity values of the site in the medium to long term, as relevant.	This Report
Where the proposal is likely to significantly affect threatened species within the meaning of Section 7.2 of the *Biodiversity Conservation Act 2016*, the application for development consent is to be accompanied by a Biodiversity Development Assessment Report,	This Report
Biodiversity impacts related to the proposal are to be assessed in accordance with the Biodiversity Assessment Method and documented in a Biodiversity Development Assessment Report (BDAR). The BDAR must include information in the form detailed in the *Biodiversity Conservation Act 2016* (s6.12), *Biodiversity Conservation Regulation 2017* (s6.8) and Biodiversity Assessment Method.	This Report
The BDAR must document the application of the avoid, minimise and offset hierarchy including assessing all direct, indirect and prescribed impacts in accordance with the Biodiversity Assessment Method.	Section 7
The BDAR must include details of the measures proposed to address the offset obligation as follows: • The total number and classes of biodiversity credits required to be retained for the proposal. • The number and classes of like-for-like biodiversity credits proposed to be retired. • The number and classes of biodiversity credits proposed to be retained in accordance with the variation rules. • Any proposal to fund a biodiversity conservation action. • Any proposal to make a payment to the Biodiversity Conservation Fund. If seeking approval to use the variation rules, the BDAR must contain details of the reasonable steps that have been taken to obtain requisite like-for-like biodiversity credits.	Section 11

The BDAR must be prepared by a person accredited in accordance with the Accreditation Scheme for the Application of the Biodiversity Assessment Method Order 2017 under s6.10 of the Biodiversity Conservation Act 2016.	

1.4 SOURCE OF INFORMATION USED IN THE ASSESSMENT

The following information sources were used in this BDAR:

- Proposal layers, construction methodology and concept designs provided by Balranald Gypsum Pty Ltd.
- SIX Map Cadastral Data (NSW Department of Finance and Services) accessed at https://maps.six.nsw.gov.au/
- Biodiversity Assessment Method Calculator (BAM-C). Accessed at https://customer.lmbc.nsw.gov.au/assessment/s/
- Biodiversity Assessment Method 2020 and Biodiversity Assessment Method Operational Manual (Department of Planning, Industry and Environment)
- NSW BioNet threatened biodiversity database collection (TBDC)

  Accessed online via login at http://www.bionet.nsw.gov.au/
- NSW BioNet Vegetation Classification Database (Veg -C)

  Accessed online via login at https://www.environment.nsw.gov.au/research/Visclassification.htm
- NSW Bionet Vegetation Map Collection

  Accessed online at http://www.environment.nsw.gov.au/research/VISmap.htm
- NSW Biodiversity Values Map
  https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
- NSW Government SEED Mapping

  https://geo.seed.nsw.gov.au/Public_Viewer/index.html?viewer=Public_Viewer&locale=en-AU
- Australia's IBRA Bioregions and sub-bioregions.
  http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 3
- NSW Threatened Species Profiles
  http://www.environment.nsw.gov.au/threatenedspeciesapp/ and
  www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- Plantnet NSW. Accessed at https://plantnet.rbgsyd.nsw.gov.au/
- Australian Government Protected Matters Search Tool

  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool on 18th Sept 2019 and 6th January 2021
- Australian Government's Species Profiles and Threats (SPRAT) database
  http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

2 LANDSCAPE CONTEXT

2.1 IBRA BIOREGIONS AND SUBREGION

Interim Biogeographic regionalisation for Australia (IBRA) Bioregions are geographically distinct bioregions based on common climates, geology, landforms and native vegetation (Thackaway and Creswell, 1995) There are 89 IBRA bioregions within Australia. The proposal falls within the Murray Darling Depression IBRA Bioregion. The Murray Darling Depression lies in the southwest corner of NSW and extends into Victoria and South Australia. The total bioregion covers 19,717,651 ha. Within NSW the bioregion is bounded by the Broken Hill Complex, Cobar Peneplain, Riverina and Darling Riverine Plains Bioregions. The Murray River, Murrumbidgee River, Lachlan River, darling River, Barwon River, Yanda River and Peacock Creek catchment occur within this IBRA Bioregion.

The development site occurs within the South Olary Plain IBRA Subregion. The South Olary Plain Subregion is characterised by dune fields, sandplains, dry lakes and groundwater basins. The South Olary Plains also contains quaternary aeolian sands and lake sediments. Vegetation communities within the IBRA subregion include:

- Diverse Mallee on sands with porcupine grass and diverse shrubs.
- Belah, Rosewood, Black Bluebush, Pearl Bluebush, Old Man Saltbush on sandplains and heavier soils.
- Black Box fringing depressions.
- Halophytes on salines.
- Chenopod Shrublands on lunettes, sometimes with White Cypress Pine.

The Murray Darling Depression IBRA bioregion and South Olary Plain IBRA subregion was entered into the BAM-C for the purposes of this assessment.

2.2 NSW MITCHELL LANDSCAPE REGIONS AND AREA

The development site falls within the Mallee Cliffs Sandplain Mitchell Landscape (Figure 2-1). This landscape was entered in the BAM-C for the purposes of this assessment.

2.3 RIVERS AND STREAMS

The nearest watercourse is the Murrumbidgee River located around 5-8 km East through to South of the development site.r. The Murrumbidgee River is a permanent watercourse with associated ephemeral wetlands. No watercourses occur within 1500 m of the development site.

2.4 WETLANDS

An EPBC Protected Matters search completed on 18th September 2019 and again on the 6th January 2021 identified four wetlands of international importance. The closest of these to the development site Hattah-kulkyne lakes 50- 100 km upstream. No swamps or wetland were identified within the development site or within the 1500 m locality. No wetland areas are identified within Lot 6655 DP 769428 under the Balranald LEP 2010. Two small man-made dam exists within the 1500 m locality, however no man made dams exist within the development site (Figure 2-1).

2.5 CONNECTIVITY FEATURES

The 1500 m locality is largely cleared for agriculture However, connectivity of native vegetation extent occurs in a North-South direction surrounding the development site, Smaller linear patches of connectivity also surround the development site in an East-West direction. andrs. This vegetation connects the development site to the Murrumbidgee River and Yanga National Park to the east and a large tract (>90 km^2) of remnant vegetation to the west.

2.6 AREAS OF GEOLOGICAL SIGNIFICANCE

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the development site. Shallow deposits of Gypsum occur within the locality and development site. The Balranald district is known for having high purity gypsum deposits (NSW Government, 2020). Gypsum is an evaporative mineral that forms when saline water evaporates. Gypsum deposits are underground and do not provide any further habitat for fauna species.

2.7 AREAS OF OUTSTANDING BIODIVERSITY VALUE

No Areas of Outstanding Biodiversity Value occurs within or adjacent to the development site. No areas of high biodiversity value under the Biodiversity Conservation Regulation 2017 occur within or adjacent to thedevelopment site.

2.8 PERCENT NATIVE VEGETATION COVER

Method applied

The proposal conforms to the definition of a *site-based development* under the Biodiversity Assessment Methodology. The site-based development assessment methodology has been used in this BAM assessment. The Percent Native Vegetation was calculated by estimating the percent cover of native vegetation relevant to the benchmark for the PCT. PCTs were allocated based on existing vegetation mapping, field inspections and aerial imagery.

Native Vegetation Cover

An assessment of native vegetation within the 1500 m buffer area was undertaken using aerial imagery, State Vegetation Mapping (VIS_ID 4492, OEH, 2016) and field assessments. Approximately 972. 7 ha of native vegetation occurs in the surrounding 1500 m buffer area. This vegetation in the landscape surrounding the development site is predominately comprised of PCT 170 : Chenopod Sandplain Mallee woodland/shrubland of the arid and semi-arid (warm) zones".

Cleared Areas

An assessment of cleared vegetation within the 1500 m buffer area was undertaken using aerial imagery, State Vegetation Mapping (VIS_ID 4492, OEH, 2016), NSW Landuse Mapping (OEH, 2017) and field assessments. Approximately 777 ha occurs as cleared areas within the 1500 m buffer around the development site. These cleared areas are primarily agricultural land used for cropping and modified pastures with one small area of manufacturing and industrial land use.

Percent native vegetation cover

The 1500 m buffer area around the development site comprises as area of 1750 ha. As determined by GIS mapping from aerial imagery, approximately 972.7 ha of native vegetation occurs in the 1500 m buffer area (Figure 2-1).

Thus, the Percent Native Vegetation Cover within the 1500 m buffer area surrounding the development site was calculated to be 56%. This was entered into the BAM calculator for the purposes of this assessment.

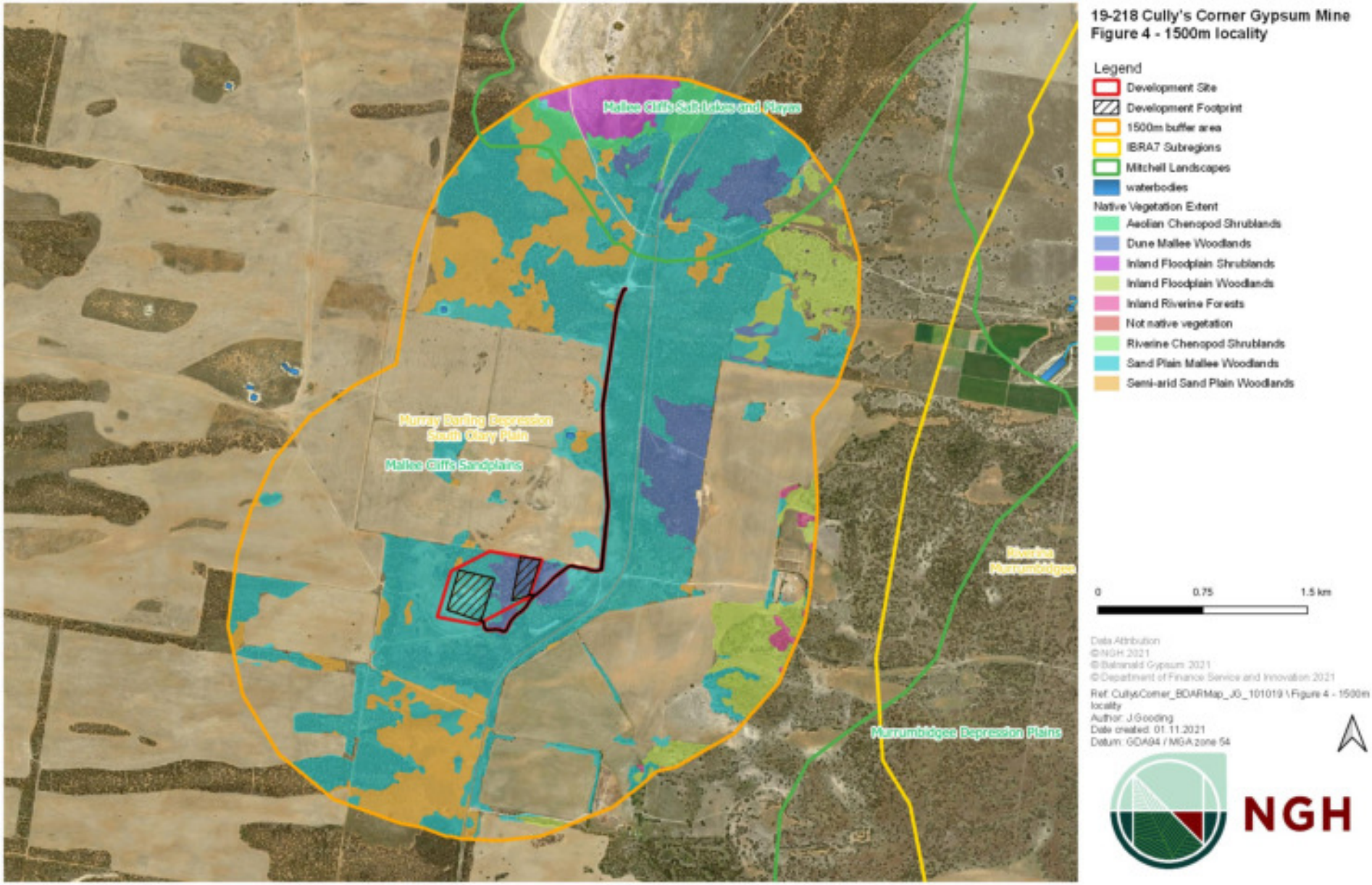


Figure 2-1 Location map

3 NATIVE VEGETATION

3.1 NATIVE VEGETATION EXTENT

Approximately 28.3 ha of native woodland/shrubland and mallee occurs within the development site (Figure 3-1). This is comprised of approximately:

- 17.88 ha of PCT 170: *Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zone*; and,
- 8.12 ha of PCT: 171 *Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion*.

No areas of exotic vegetation (broad acre cropping, pasture, exotic grassland etc) was mapped within the development site.

Cleared areas occurs along the unsealed access roads to be upgraded and comprise an area of 2.3 ha.

Figure 3-1 Native vegetation extent within the development site Map 1

Figure 3-2 Native Vegetation Extent within the development site Map 2

Figure 3-3 Native Vegetation Extent within the development site Map 3

3.2 PLANT COMMUNITY TYPES (PCTS)

3.2.1 Methods to assess PCTs

Review of existing information

A search was undertaken of OEH Bionet Vegetation Information System (VIS) database and NSW SEED Mapping Portal to access existing vegetation mapping information within the development site. Two relevant exiting vegetation maps were assessed:

- *SEED Mapping – Sharing and Enabling Environmental Data (NSW Government, 2019).*
- *Western Region State and Vegetation Mapping Version 1.0 VIS_ID 4492.*

These two vegetation maps provided the same information. 3 PCTs were mapped to be present within a 100 m buffer from the development site. These mapped PCTs were:

- PCT170 *Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones*
- PCT 171 *Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion*
- PCT 58 *Black Oak - Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion*

Floristic survey

An initial site survey was undertaken on the 23rd September 2019 – 24th September 2019. The entire development site was surveyed by two ecologists via car and foot. The aim of this survey was to confirm the PCTs present in the development site and their condition and extent. Random meander searches were conducted to determine the flora species present. PCTs were identified from the native species identified, landforms, physiography and location in the IBRA subregion using the BioNet Vegetation Classification Database. The development site was then stratified into areas of similar condition class to determine vegetation zones for each PCT.

Detailed floristic surveys were undertaken on the 23rd, 24th September and 3rd December 2019 including nine Vegetation Integrity (VI) plots. An additional three VI plots were undertaken on the 12th November 2020. VI plots, of 20 m by 50 m, were established in each vegetation zone. Data was collected on the composition, structure and function of the vegetation. Data was collected utilising the methodology presented in the BAM 2017 by persons trained in the BAM and under the direction of persons accredited under the BAM.

3.2.2 PCTs identified on the development site

Based on the field surveys, two PCTs were identified to occur within the development site (Figure 3-6 - *Figure 3-8*).
These are:

- PCT 170 - *Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones.*
- PCT 171 – *Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion*

A description of these PCTs identified within the development site follow within Table 3-1 and Table 3-2 which include justification of PCT selection.

Table 3-1: PCT description – 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm zones)

PCT: 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones		
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)	
Vegetation class	Sand Plain Mallee Woodlands	
Vegetation type	PCT ID	170
	Common Community Name	PCT: 170 Chenopod sandplain mallee woodland/shrubland
Approximate extent within the development site	17.88 ha of this PCT was determined to occur across the development site. This PCT occurs in varying condition throughout the development site with some areas as intact woodlands while other areas are heavily cleared with no remaining overstory species. A total of 11.24 ha of this PCT is within the development footprint.	
Species relied upon for PCT identification	Species name	Relative abundance (average % Cover in 400m2 plot)
	White Mallee *Eucalyptus socialis*	10%
	Snap and Rattle *Eucalyptus gracilis*	10%
	Mallee Bluebush *Maireana pentatropis*	<1%
	Black Bluebush *Maireana pyramidata*	<1%
	Grey Copperburr *Sclerolaena diacantha*	<1%
	Ruby Saltbush *Enchylaena tomentosa*	<1%
	Slit-wing Bluebush *Maireana georgei*	<1%
	Prickly Saltwort *Salsola australis*	<1%
	Shrubby twinleaf *Zygophyllum aurantiacum*	<1%
Justification of evidence used to identify the PCT	The understory of the plant community in the development site has been highly disturbed and degraded from vehicle use and grazing and low coverage of understory species remains. PCT identification was based on the overstory mallee species, characteristic understory species listed in the table above, landscape and locality. Four PCTS were considered (PCT 170, PCT 171, PCT 172 & PCT 173) were considered that had the dominant overstory species of *E. socialis* and *E. gracilis* occurring in the Murray Darling Depression IBRA Region. PCT 170 was considered the best match based on the dominance of chenopod species in the understory consistent with this PCT and its location on sandy plains.	

PCT: 170 Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	
TEC Status	This PCT can be associated with the Acacia loderi Shrublands TEC and Acacia melvillei Shrublands TEC however no characteristic Acacia species from these TECs were present within the plant community in the development site. The PCT within the development site is not considered to form part of a TEC.
Estimate of percent cleared in IBRA subregion.	41% cleared
Examples	 Figure 3-4 Example of PCT 170

Table 3-2: PCT description. – 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion

PCT: 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion		
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)	
Vegetation class	Dune Mallee Woodlands	
Vegetation type	PCT ID	171
	Common Community Name	PCT: 170 Spinifex linear dune mallee
Approximate extent within the development site	8.12 ha of this PCT occurred within the development site. 0.62 ha of this PCT occurs within the development footprint.	

PCT: 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion		
Species relied upon for PCT identification	Species name	Relative abundance (% Cover in)
	White Mallee *Eucalyptus socialis*	5%
	Snap and Rattle *Eucalyptus gracilis*	10%
	Porcupine Grass – *Triodia scariosa*	30
	Black Bluebush *Maireana pyramidata*	<1%
	Grey Copperburr *Sclerolaena diacantha*	<1%
	Ruby Saltbush *Enchylaena tomentosa*	<1%
	Sclerolaena parviflora	<1%
	Grey Mulga *Acacia brachybotrya*	<1%
Justification of evidence used to identify the PCT	Three floristic plots were undertaken in this PCT. The understory of the plant community in the development site has been highly disturbed and degraded from vehicle use and grazing and low coverage of understory species remains. PCT identification was based on the overstory mallee species, characteristic understory species listed in the table above, landscape and locality. Four PCTS were considered (PCT 170, PCT 171, PCT 172 & PCT 173) were considered that had the dominant overstory species of *E. socialis* and *E. gracilis* occurring in the Murray Darling Depression IBRA Region. PCT 171 was considered the most likely PCT based on the dominance of *Triodia scariosa* in the understory consistent with this PCT and the change in soil type to red-brown sandy loams.	
TEC Status	No associated TECs	
Estimate of percent cleared in IBRA subregion.	19% cleared	

PCT: 171 Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	
Examples	 Figure 3-5 Example of PCT 171

Figure 3-6 PCTs in the development site Map 1

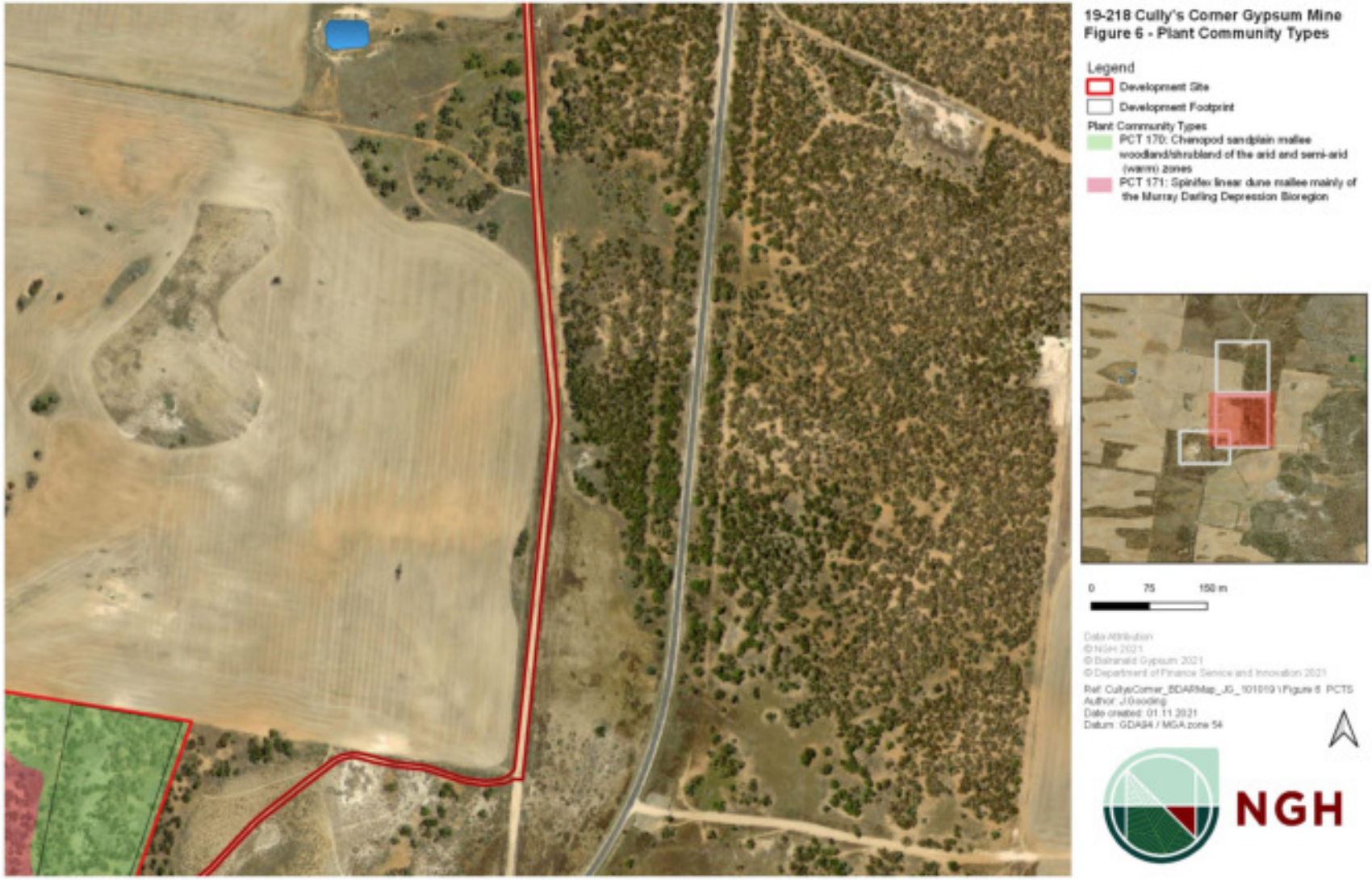


Figure 3-7 PCTS in the development site Map 2

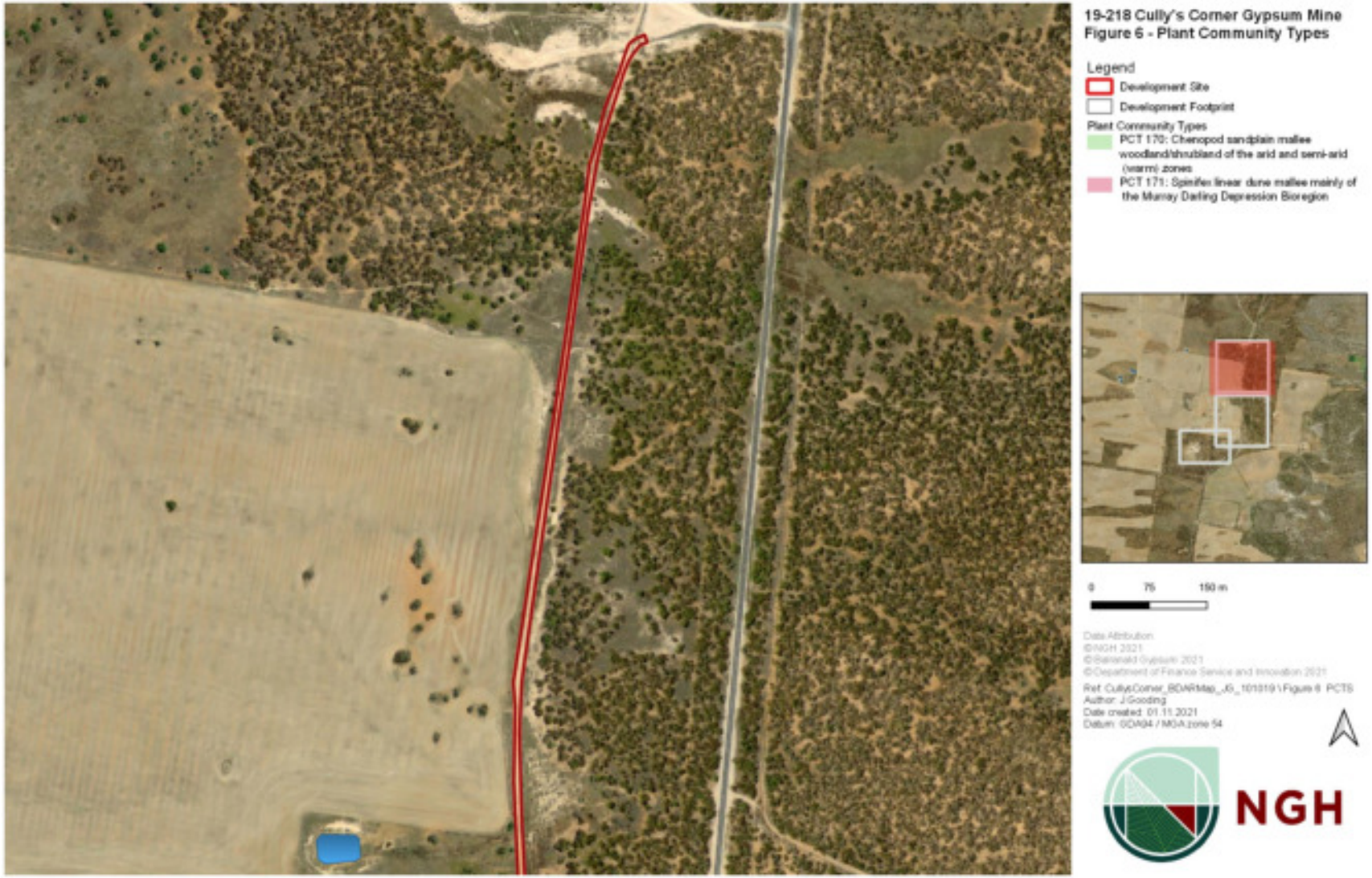


Figure 3-8 PCTS in the development site Map 3

3.3 VEGETATION INTEGRITY ASSESSMENT

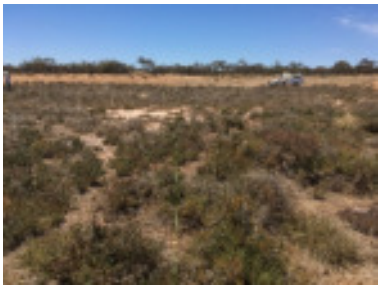
3.3.1 Vegetation zones and survey effort

The random meander, overview inspection and detailed floristic plots have been used to assist the delineation of zones. Five vegetation zones were delineated within the two PCTs in the development site (Table 3-3 and Figure 3-9) based on overstory and understory condition. Eleven plots were undertaken throughout the five zones. The number of floristic plots was in line with the minimum plot requirements per zone area as specified in the BAM 2020.

The details of the road upgrade areas were not provided prior to the site surveys and these areas of road upgrade were not surveyed. Vegetation assessment for these areas was undertaken using desktop analysis from aerial imagery, state vegetation mapping and prior knowledge of the site from past surveys. Aerial imagery indicated most areas of road upgrade were disturbed and not vegetated. Where road widening was to occur though vegetation, areas were assigned PCTS based on the state vegetation mapping and aerial imagery of vegetation condition (whether woodland or derived shrubland). Vegetation condition classes were matched to the vegetation condition score from the same PCTs and Zones from the site surveys.

Table 3-3 Vegetation zones at the development site

Zone ID	PCT ID	Condition	Zone area (ha) in Devt Site	Zone Area (ha) in Devt foot	Survey effort (# plots)	Patch size (ha)	
1	170	Woodland. This zone is comprised of an overstory of Mallee woodland (*E. socialis* & *E. gracilis*). The understory is highly disturbed understory from prior soil disturbance and vehicle use but some chenopod species remain. It is in good condition	8.81	5.16	3	100+	
2	170	Shrubland Based on its locality, this zone is likely to have once formed the Chenopod Sandplain Mallee Woodland PCT 170 but has been previously cleared through prior mining activities. There is no overstory but some native chenopod species have	7.24	4.24	3	100+	

Zone ID	PCT ID	Condition	Zone area (ha) in Devt Site	Zone Area (ha) in Devt foot	Survey effort (# plots)	Patch size (ha)	
		recolonised. It is in poor condition.					
3	170	Highly disturbed Based on its locality, this zone is likely to have once formed the Chenopod Sandplain Mallee Woodland PCT 170 but has been previously cleared through prior mining activities. There is no overstory but some native chenopod species have recolonised. It is in poor condition	1.54	1.54	1	100+	
4	170	Shrubland revegetated Based on its locality, this zone is likely to have once formed the Chenopod Sandplain Mallee Woodland PCT 170 but has been previously cleared through prior mining activities. There is no overstory but native chenopod species have been revegetated. It is in poor condition.	0.29	0.29	1	100+	
5	171	Woodland This zone is comprised of an overstory of Mallee Woodland (*E. socialis* & *E. gracilis*). It is in good condition	8.12	0.62	3	100+	

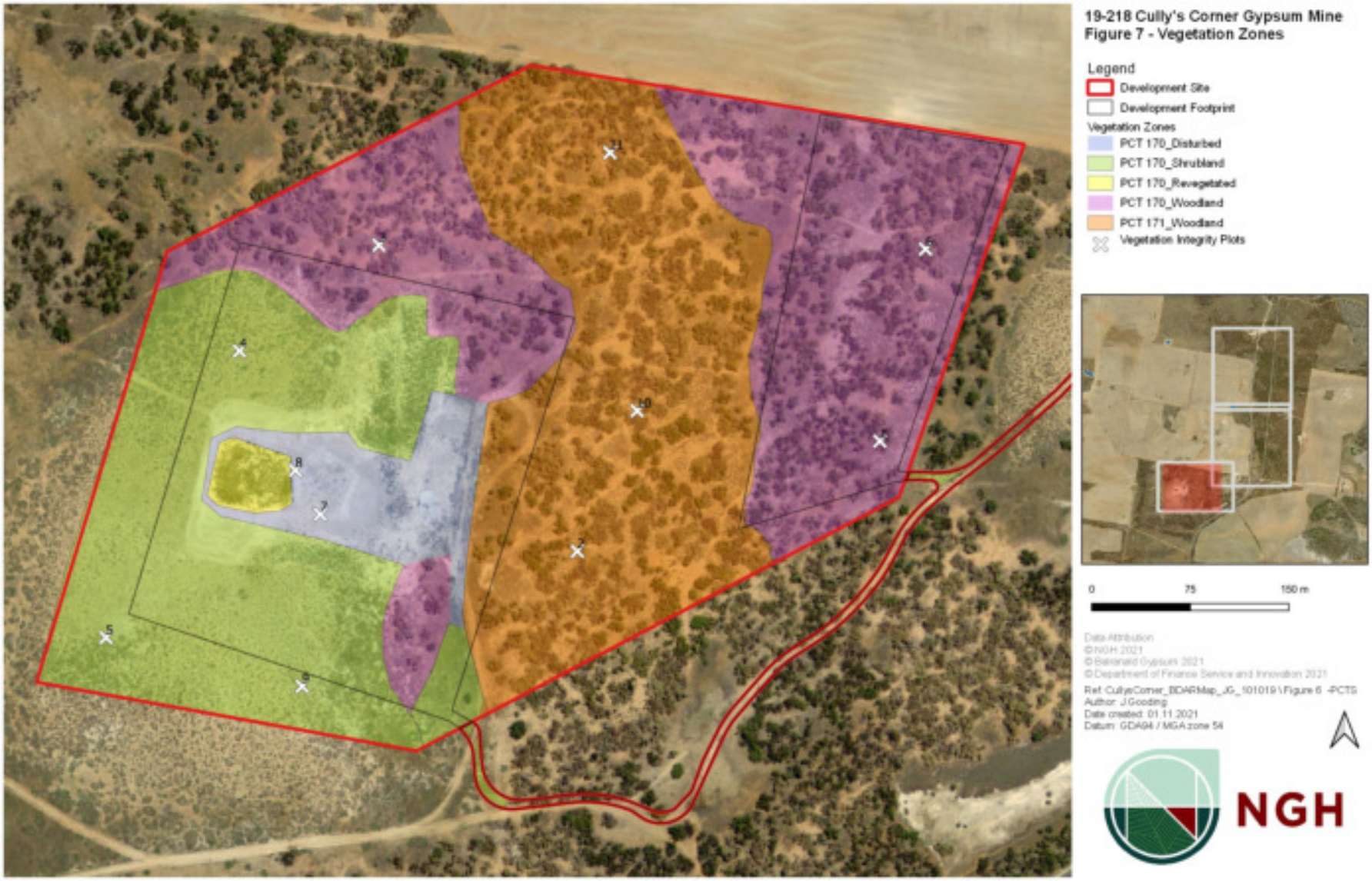


Figure 3-9 Vegetation zones in the development site Map 1

Figure 3-10 Vegetation zones in the development site Map 2

Figure 3-11 Vegetation zones in the development site Map 3

3.3.2 Vegetation integrity assessment results

The plot data from the vegetation integrity survey plots were entered into the BAM Calculator (Case 0017880) by an accredited assessor (BAAS18074). Plot data can be found in APPENDIX A.

The results of the vegetation integrity assessment are provided in Table 3-4.

Table 3-4 Current vegetation integrity scores for each vegetation zone within the development site

Zone ID	Zone Name	Composition score	Structure score	Function score	Vegetation Integrity Score
1	PCT 170_Woodland_good	80.8	26.4	79.2	55.3
2	PCT 170_Shrubland_poor	44.8	31.6	0.3	7.1
3	PCT 170_Disturbed_poor	31.6	0.4	0	0.8
4	PCT 170_Revegetated_poor	1.2	31.9	2.1	4.2
5	PCT 171_ Woodland_good	79.2	77.6	41.8	63.6

4 THREATENED SPECIES

4.1 ECOSYSTEM CREDIT SPECIES

The ecosystem credit species listed in Table 4-1 were returned by the calculator as being associated with the PCTs present on the development site. These species are assumed to occur and contribute to ecosystem credits.

Table 4-1 Ecosystem Credit Species

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Fauna			
Bardick *Echiopsis curta*	PCT 171	Endangered	Not listed
Black Falcon *Falco subniger*	PCT 171	Vulnerable	Not listed
Black-breasted Buzzard *Hamirostra melanosternon*	PCT 171 PCT 170	Vulnerable	Not listed
Bolam's Mouse *Pseudomys bolami*	PCT 171 PCT 170	Endangered	Not Listed
Chestnut Quail-thrush *Cinclosoma castanotum*	PCT 171 PCT 170	Vulnerable	Not Listed
Corben's Long-eared Bat *Nyctophilus corbeni*	PCT 171 PCT 170	Vulnerable	Vulnerable
Diamond Firetail *Stagonopleura guttata*	PCT 171 PCT 170	Vulnerable	Not Listed
Dusky Woodswallow (eastern subspecies) *Artamus Cyanopterus cyanopterus*	PCT 171 PCT 170	Vulnerable	Not Listed
Gilbert's Whistler *Pachycephala inornata*	PCT 171 PCT 170	Vulnerable	Not Listed
Grey Falcon *Falco hypoleucos*	PCT 171 PCT 170	Endangered	Vulnerable

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Hooded Robin (south-eastern form) *Melanodryas cucullata cucullata*	PCT 171 PCT 170	Vulnerable	Not Listed
Inland Forest Bat *Vespadelus baverstocki*	PCT 171 PCT 170	Vulnerable	Not Listed
Jewelled Gecko *Strophurus elderi*	PCT 171 PCT 170	Vulnerable	Not listed
Kultarr *Antechinomys laniger*	PCT 171 PCT 170	Endangered	Not Listed
Little Eagle *Hieraaetus morphnoides*	PCT 171 PCT 170	Vulnerable	Not Listed
Little Pied Bat *Chalinolobus picatus*	PCT 171 PCT 170	Vulnerable	Not Listed
Major Mitchell's Cockatoo *Lophochroa leadbeateri*	PCT 171 PCT 170	Vulnerable	Not listed
Mallee Slender Blue-tongue Lizard *Cyclodomorphus melanops elongatus*	PCT 171	Endangered	Not Listed
Mallee Worm-lizard *Aprasia inaurita*	PCT 171 PCT 170	Endangered	Not Listed
Malleefowl *Leipoa ocellata*	PCT 171 PCT 170	Endangered	Vulnerable
Marble-faced Delma *Delma australis*	PCT 171 PCT 170	Endangered	Not listed
Pied Honeyeater *Certhionyx variegatus*	PCT 171 PCT 170	Vulnerable	Not Listed
Purple-crowned Lorikeet *Glossopsitta porphyrocephala*	PCT 171 PCT 170	Vulnerable	Not listed
Purple-gaped Honeyeater *Lichenostomus cratitius*	PCT 171 PCT 170	Vulnerable	Not listed

Common Name	Associated PCT	NSW Listing Status	National Listing Status
Regent Parrot (eastern subspecies) *Polytelis Anthopeplus monarchoides*	PCT 171 PCT 170	Endangered	Vulnerable
Ringed Brown Snake *Pseudonaja modesta*	PCT 171 PCT 170	Endangered	Not listed
Sandy Inland Mouse *Pseudomys hermannsburgensis*	PCT 171	Vulnerable	Not Listed
Scarlet-chested Parrot *Neophema splendida*	PCT 171 PCT 170	Vulnerable	Not Listed
Shy Heathwren *Hylacola cautus*	PCT 171 PCT 170	Vulnerable	Not Listed
Southern Ningaui *Ningaui yvonneae*	PCT 171 PCT 170	Vulnerable	Not Listed
Southern Scrub-robin *Drymodes brunneopygia*	PCT 171	Vulnerable	Not Listed
Spotted Harrier *Circus assimilis*	PCT 171 PCT 170	Vulnerable	Not Listed
Striped-faced Dunnart *Sminthopsis macroura*	PCT 171	Vulnerable	Not Listed
Varied Sittella *Daphoenositta chrysoptera*	PCT 171 PCT 170	Vulnerable	Not Listed
Wedgesnout Ctenotus *Ctenotus brooksi*	PCT 171	Vulnerable	Not Listed
Western Blue-tongue Lizard *Tiliqua occipitalis*	PCT 171 PCT 170	Vulnerable	Not Listed
Western Pygmy Possum *Cercartetus concinnus*	PCT 171 PCT 170	Endangered	Not Listed
Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*	PCT 170	Vulnerable	Not Listed
Yellow-tailed Plain Slider *Lerista xanthura*	PCT 171 PCT 170	Vulnerable	Not Listed

4.1.1 Ecosystem species excluded from the assessment

White-bellied Sea-Eagle – *Haliaeetus leucogaster*, (BC Act – Vulnerable; EPBC Act Not Listed) was excluded as the development site is more than 1km from watercourses and/or large hydroareas such as dams.

4.2 SPECIES CREDIT SPECIES

4.2.1 Candidate species to be assessed

The BAM Calculator predicted 24 species credit species to occur at the development site, as presented in Table 4-2. A desktop assessment was undertaken for habitat constraints and geographic restrictions to determine which species would be included or excluded for further targeted surveys in the development site.

Table 4-2 Candidate species credit species requiring assessment

Species Credit Species	Associated PCT	Habitat components and geographic restrictions [1]	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
FLORA								
Harrow Wattle *Acacia acanthoclada*	PCT 170	Deep siliceous sands	High	Endangered	Not listed	Sandy soils within development site	Included	Habitat components on site
A Saltbush ***Atriplex infrequens***	PCT 170	n/a	High	Vulnerable	Vulnerable		Included	Suitable habitat on site
A spear-grass ***Austrostipa metatoris***	PCT 170	n/a	High	Vulnerable	Vulnerable		Included	Suitable habitat on site
A burr-daisy ***Calotis moorei***	PCT 170	n/a	High	Endangered	Endangered		Included	Suitable habitat on site
Bluebush Daisy ***Cratystylis conocephala***	PCT 170	n/a	Moderate	Endangered	Not listed		Included	Suitable habitat on site
Desert Hopbush ***Dodonaea stenozyga***	PCT 170	n/a	High	Critically Endangered	Not Listed		Included	Suitable habitat on site
Winged Peppercress ***Lepidium monoplocoides***	PCT 170	n/a	High	Endangered	Endangered		Included	Suitable habitat on site

Species Credit Species	Associated PCT	Habitat components and geographic restrictions [1]	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Pink Velvet Bush ***Lasiopetalum behrii***	PCT 170	Shallow sandy soils	High	Critically Endangered	Not Listed	Sandy soils within development site	Included	Habitat components on site
Button Immortelle ***Leptorhynchos waitzia***	PCT 170	n/a	High	Endangered	Not Listed		Included	Suitable habitat on site
Thyme Rice-Flower ***Pimelea serpyllifolia subsp. Serpyllifolia***	PCT 170	Within 50km of the Murray River	High	Endangered	Not Listed	Development site 40km from Murray River	Included	Within geographic distribution
Greenhood Orchid ***Pterostylis cobarensis***	PCT 170	n/a	Moderate	Vulnerable	Not Listed		Included	Suitable habitat on site
Bitter Quandong ***Santalum murrayanum***	PCT 170	Sandy Loam or loamy sand soils	Moderate	Endangered	Not Listed	Sandy Loam soils present	Included	Habitat components on site
Bladder Senna ***Swainsona colutoides***	PCT 170	n/a	High	Endangered	Not Listed		Included	Suitable habitat on site
Yellow Swainson-pea ***Swainsona pyrophila***	PCT 170	n/a	High	Vulnerable	Vulnerable		Included	Suitable habitat on site

Species Credit Species	Associated PCT	Habitat components and geographic restrictions [1]	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
FAUNA								
Major Mitchell's Cockatoo *Lophochroa leadbeateri*	PCT 170	Living or dead trees with hollows greater than 10cm diameter Hollow bearing trees	High	Vulnerable	Not listed	Hollow bearing trees present within development site	Included	Habitat components on site
Southern Hairy-nosed Wombat *Lasiorhinus latifrons*	PCT 170	Semi-arid Grasslands and open woodlands.	High	Endangered	Not Listed		Included	Suitable habitat on site
Regent Parrot *Polytelis anthopeplus monarchoides*	PCT 170	Living or dead *E. camaldulensis* with hollows greater than 5 cm diameter, greater than 5 m above the ground OR trees with DBH of greater than 40cm, within 1 km of watercourses or billabongs. Trees can be isolated but within 20 km of mallee.	High	Endangered	Vulnerable	No *E. camaldulensis* within development site or large trees within 1km of a watercourse.	Excluded	No breeding habitat on site
Painted Burrowing Frog *Neobatrachus pictus*	PCT 170	Occur in open grassland, mallee, woodland, farmland and cleared areas and are usually found in or around flooded areas after periods of heavy rainfall, including grassy marshes, lagoons, flooded claypans, temporary roadside pools, ditches, mallee swales and farm dams.	Moderate	Endangered	Not listed		Excluded	No water bodies or areas for pooling water within development site.
Crowned Gecko	PCT 170	n/a	High	Vulnerable	Not Listed		Included	Suitable habitat on site

Species Credit Species	Associated PCT	Habitat components and geographic restrictions [1]	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Lucasium stenodactylum								
White Bellied Sea-Eagle ***Haliaeetus leucogaster***	PCT 170	Living or dead trees within suitable vegetation within 1km of a river, lake, large dam or creek, wetland and coastline	High	Vulnerable	Not Listed	Development site not within 1km of a large waterbody.	Excluded	Habitat components absent
Black-breasted Buzzard ***Hamirostra melanosternon***	PCT 170	Waterbodies. Land within 40m of riparian woodland on inland watercourses/waterholes containing dead or dying eucalypts.	Moderate	Vulnerable	Not Listed	No waterbodies, watercourses or waterholes within 40m of development site	Excluded	Habitat components absent
Little Eagle ***Hieraaetus morphinoides***	PCT 170	Nest trees – live large old trees within vegetation	Moderate	Vulnerable	Not Listed	Stick nests observed	Included	Habitat components on site
Striated Grasswren ***Amytornis striatus***	PCT 171	Confined to areas with mature spinifex, usually in association with mallee eucalypts and sandy soils	High	Critically Endangered	Not listed	Spinifex, Mallee Eucalypts and sandy soils within development site.	Included	Habitat components on site
Desert Mouse ***Pseudomys desertor***	PCT 171	Sand dune or sand plain habitats dominated by Spinifex	Moderate	Vulnerable	Not Listed	Spinifex and sandy soils within development site.	Included	Habitat components on site

[1] Threatened Biodiversity Data Collection (Bionet), (DPIE, 2020c)

4.2.2 Exclusions based on habitat features

Four candidate species were excluded from the assessment and no suitable breeding habitat was considered to occur in the development site. These species are the Painted Burrowing Frog, White Bellied Sea Eagle, Black Breasted Buzzard and the Regent Parrot and listed in Table 4-2 above.

The Painted Burrowing frog was excluded as there was no suitable breeding habitat within the development site. No aquatic habitat or pools of water occurred within the development site.

The White Bellied Sea Eagle, Black Breasted Buzzard and Regent Parrot was excluded as the development site was not within 1km of a waterbody. The nearest large waterbody is the Murrumbidgee River occurring around 5km to the East of the site. These species use large waterbodies for breeding.

4.2.3 Inclusions based on habitat features

A NSW Bionet search was undertaken in November 2019 and again in October 2021 and recorded the following species within 10km (Table 4-3) . One species, Redthroat (*Pyrrholaeus brunneus*) occurs in the area and suitable habitat occurs within the development site. This species was added to the BAM-C as an ecosystem species. The remaining species were already incorporated within the BAM Calculator or the site provided no suitable habitat.

Table 4-3 Bionet records considered for inclusion within the BAM calculator

Species	Inclusion in BAM-C required
Black Falcon	Generated by BAM-C as Ecosystem Species
Brown Treecreeper (eastern subspecies)	Generated by BAM-C as Ecosystem Species
Chestnut Quail-thrush	Generated by BAM-C as Ecosystem Species
Fork-tailed Swift	No impact to aerial habitats
Freckled Duck	No Waterbodies present in development site
Inland Forest Bat	Generated by BAM-C as Ecosystem Species
Little Eagle	Generated by BAM-C as Ecosystem Species
Little Pied Bat	Generated by BAM-C as Ecosystem Species
Major Mitchell's Cockatoo	Generated by BAM-C as Ecosystem Species
Mallee Worm-lizard	Generated by BAM-C as Ecosystem Species
Malleefowl	Generated by BAM-C as Ecosystem Species
Menindee Nightshade	Historic records 1938

Species	Inclusion in BAM-C required
Mossgiel Daisy	No associated vegetation types or clay soils present in development site
Plains Wanderer	No suitable Grassland Habitat within site
Pied Honeyeater	Generated by BAM-C as Ecosystem Species
Redthroat	Can occur in Mallee woodlands and chenopod shrublands present in development site.
Southern Bell Frog	No waterbodies present in development site
Spotted Harrier	Generated by BAM-C as Ecosystem Species
Spotted-tailed Quoll	Vagrant – not confirmed record
Varied Sittella	Generated by BAM-C as Ecosystem Species
Western Pygmy Possum	Generated by BAM-C as Ecosystem Species
White-bellied Sea-Eagle	Generated by BAM-C as Ecosystem Species
White-fronted Chat	No associated vegetation type
Yellow-bellied Sheathtail-bat	Generated by BAM-C as Ecosystem Species

4.2.4 Candidate species requiring confirmation of presence or absence

The species listed in Table 4-4 are those that are considered to have habitats present at the development site. One species, Greenhood Orchid was unable to be surveyed for due to poor climatic conditions. As per the requirements of the BAM, it is assumed to occur within suitable habitat in the development site.

Targeted surveys have been conducted for the remaining species. None of these species were determined to occur within the development site.

Details of the survey methodologies and results are provided for each surveyed species in section 4.2.4. Targeted survey locations and species are mapped on Figure 4-2

Table 4-4 Summary of species credit species surveyed at the development site

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Acacia acanthoclada Harrow Wattle	2	Surveyed November 2020	No	**n/a**

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Atriplex infrequens A Saltbush	2	Surveyed November 2020 and December 2019	No	n/a
Austrostipa metatoris A spear-grass	2	Surveyed Nov 2020 and December 2019	No	n/a
Calotis moorei A burr-daisy	3	Surveyed Nov 2020 and Dec 2019	No	n/a
Cratystylis conocephala Bluebush Daisy	2	Surveyed Nov 2020 and Dec 2019	No	n/a
Dodonaea stenozyga Desert Hopbush	3	Surveyed Nov 2020 and Dec 2019	No	n/a
Lasiopetalum behrii Pink Velvet Bush	3	Surveyed Nov 2020 and Dec 2019	No	n/a
Lepidium monoplocoides Winged Peppercress	2	Surveyed Nov 2020 and Dec 2019	No	n/a
Leptorhynchos waitizia Button immortelle	3	Surveyed Nov 2020 and Dec 2019	No	n/a
Pimelea serpyllifolia subsp. *Serpyllifolia* Thyme Rice-Flower	3	Surveyed Nov 2020 and Dec 2019	No	n/a
Pterostylis cobarensis Greenhood Orchid	2	Surveyed but inadequate conditions. Assumed Present in Zone 1 and Zone 5 (woodlands in high condition)	Assumed	5.78 ha
Santalum murrayanum Bitter Quandong	2	Surveyed Nov 2020 and Dec 2019	No	n/a
Swainsona colutoides Bladder Senna	2	Surveyed November 2020	No	n/a
Swainsona pyrophila Yellow Swainson-pea	2	Surveyed Nov 2020 and Dec 2019	No	n/a
FAUNA SPECIES				
Amytornis striatus Striated Grasswren	3	Surveyed December 2019	No	n/a
Hieraaetus morphnoides Little Eagle	1.5	Surveyed December 2020	No	n/a
Lasiorhinus latifrons Southern Hairy Nosed Wombat	2	Surveyed November 2020	No	n/a

Species Credit Species	Biodiversity risk weighting	Assumed to occur/survey/ expert report	Present on site?	Species polygon area or count
Lophochroa leadbeateri Major Mitchell's Cockatoo	2	Surveyed Nov 2020 and Dec 2019	No	n/a
Lucasium stenodactylum Crowned Gecko	2	Surveyed December 2019	No	n/a
Pseudomys desertor Desert Mouse	3	Surveyed December 2019	No	n/a

4.2.5 Threatened species survey methods

Threatened Flora (Acacia acanthoclada, Atriplex infrequens, Calotis moorei, Cratystylis conocephala, Dodonaea stenozyga, Lasiopetalum behrii, Lepidium monoplocoides, Leptorhynchos waitizia, Pimelea serpyllifolia, Pterostylis cobarensis, Santalum murrayanum, Swainsona colutoides, Swainsona pyrophila)

SURVEY EFFORT

Targeted surveys were undertaken for the candidate threatened flora species on the 3rd – 7th December 2019. Additional surveys were undertaken 11th to 12th November 2020 to capture species reliant on rainfall following a wet Winter and Spring. For each survey period, two ecologists spent 20 hours on foot using the parallel field traverse survey technique in accordance with the NSW Guide to Surveying Threatened Plants (DPIE, 2020b). Field traverses were 10m apart which was considered suitable for detection as the understory was sparse and open (Figure 4-2).

SURVEY RESULTS

No threatened flora species were detected within the development site.

The Greenhood orchid (*P. cobarensis*) is an ephemeral species, with flowering in spring dependent on soaking rains in Autumn and Winter (OEH, 2019). Surveys were undertaken but due to the drought conditions and lack of Autumn rains, the presence of Greenhood orchid was unable to be ruled out as occurring within the development site. In accordance with the BAM, Greenhood Orchid was assumed to occur within the woodland areas of the development site (Figure 4-2).

Crowned Gecko

SURVEY EFFORT

Targeted surveys were undertaken on the 3rd – 7th December 2019. Six pitfall traps were set over a period of 3 nights. Pitfall Traps were placed within sandy soils, dug down to the rim of the bucket. Traps were set out by 5pm each night and were checked by 8am in the morning. Traps were closed over the heat of the day. Each traps had leaf litter, sticks and sand at the base and each trap had 3m of fencing either side of the trap. Fencing was comprised of 30cm tall polyethylene (Plascourse) supported by 50cm steel rods.

Forty Elliot traps were set within spinifex clumps in Zone 5 (PCT 171_ Woodland) and baited with a mix of peanut butter, honey and oats. Traps were set in groups of 20 and moved to a new location each night. Elliot traps were set by 5:30 pm each night and checked by 8:30am the next morning. Traps were cleaned and baited each night.

Spot lighting on foot by a team of two ecologists was undertaken over 4 nights from 8:30 – 11pm using 1000 lumens head torches with a LED beam distance of at least a 100m.

Locations of Pitfall Traps, Elliot traps and spotlighting transects are shown in Figure 4-2.

SURVEY RESULTS

No fauna species were captured within the Pitfall traps or Elliot traps. Four reptile species were identified during the spotlighting transects. They were keyed out using Cogger, H. (2014) to be common species (Listed in Appendix B). The Crowned Gecko was not detected within the site surveys.

Major Mitchell Cockatoo

SURVEY EFFORT

Targeted surveys were undertaken on the 3rd to 7th December 2019. Searches for hollow bearing trees were undertaken to detect hollows suitable for breeding. Diurnal avian surveys were conducted in four locations throughout the site and one stag watch was undertaken from 7pm to sunset site in a suitable hollow (Figure 4-2). Opportunistic site surveys were undertaken across the entire site between 7:30 am and 12pm.

SURVEY RESULTS

Twelve bird species were observed during the surveys (APPENDIX B). The Major Mitchell Cockatoo was not detected within the site during the avian surveys. One suitable hollow occurred within the development site and no activity was observed within this hollow. The threatened parrots are not considered to occur within the development site.

Striated Grasswren

SURVEY EFFORT

Targeted surveys were undertaken on the 3rd to 7th December 2019. Avian surveys were conducted from 7pm to sunset in four locations throughout the site (refer to Figure 4-2). Avian surveys included 20 minutes bird watching surveys and call-playback for the Striated Grasswren. Opportunistic site surveys were undertaken across the entire site between 7:30 am and 12pm.

SURVEY RESULTS

Twelve bird species were observed during the surveys (APPENDIX B). The Striated Grasswren was not detected within the development site.

Desert Mouse

SURVEY EFFORT

Targeted surveys were undertaken on the 3rd – 7th December 2019. 40 Elliot traps were set within spinifex clumps in Zone 5 (PCT 171_ Woodland) and baited with a mix of peanut butter, honey and oats. Elliot traps

were set by 5:30 pm each night and checked by 8:30am the next morning. Traps were cleaned and baited each night. Spot lighting on foot by a team of two ecologists was undertaken over 4 nights from 8:30 – 11pm using 1000 lumens head torches with a LED beam distance of at least a 100m.

Locations of Elliot traps and spotlighting transects are shown in Figure 4-2

SURVEY RESULTS

No fauna species were captured within the Elliot traps. No rodents were observed during spotlighting surveys. Desert Mouse is not considered to occur within the development site.

Little Eagle

SURVEY EFFORT

Searches of medium to large stick nests within trees were undertaken in September and December 2019. Targeted bird surveys were undertaken on the 3rd to 7th December 2019 with avian surveys conducted from 7pm to sunset. Opportunistic site surveys were undertaken across the entire site between 7:30 am and 12pm. Additional surveys were undertaken in November 2020 within the 11th to 12th November and no raptors were seen.

SURVEY RESULTS

Twelve bird species were observed during the surveys (APPENDIX B). No eagles or raptors were observed during the site surveys. Four large stick nests were observed within Mallee trees within the development site (Refer to Figure 4-2). Three of these stick nests fall outside the development footprint with one stick nest occurring just within the northern boundary of the development footprint. As no raptors were observed it is not considered to be an active nest.

Southern Hairy Nosed Wombat

SURVEY EFFORT

The development site was surveyed for burrows and scat samples between the 3rd and 7th December 2019. Three warren sites were detected within the development site. These three warrens were surveyed from 8pm to Sunset using motion sensor camera traps (Recoynx). Chopped up apple baits were placed in front of the warrens.

Spot lighting on foot by a team of two ecologists was undertaken over 4 nights from 8:30 – 11pm using 1000 lumens head torches with a LED beam distance of at least a 100m .

Location of camera traps and spotlighting transects is shown in Figure 4-2

SURVEY RESULTS

Scat surveys were identified to be from Red Kangaroo (*Macropus rufus*), (G. Story (2020) *pers.com.*).

Motion sensor camera traps and sunset observations of burrows did not detect any activity of Southern Hairy Nosed Wombat. One deer, three sheep, two foxes, one hare and a Shingleback Lizard were picked up within the motion sensor camera traps. Burrows were determined to be disused rabbit warrens.

No activity of Southern Hairy Nosed Wombat was detected within the spotlighting transects and they are not considered to occur within the development site.

Figure 4-1 a. Barking Gecko (*Underwoodisaurus* milii) and *b.* Beaded Gecko (*Lucasium damaeum*)

4.3 LIMITATIONS TO DATA, ASSUMPTIONS AND PREDICTIONS

A thorough search of the development site was undertaken were possible to do so in accordance with the BAM, and relevant threatened flora and fauna guidelines. However, there is potential for some flora species not to be recorded during the survey due to the timing of the survey (outside optimal survey periods) and the prevailing dry conditions. In particular, inconspicuous or geophytic species, which typically flower outside of the completed surveyed periods may not have been recorded. Drought conditions and grazing regime may have reduced the abundance and cover of forbs and grasses. Initial rapid assessment points, and vegetation integrity plots were undertaken during a season of prolonged drought in the region. Although abundance of native species may be affected in some instances, native cover is considered to be lower generally in comparison to an average condition. However, as canopy species were largely unaffected by the drought conditions, and common, more readily identifiable shrub and groundcover species were evident, PCT determination and assessment of their overall condition, were considered to have a high confidence and considered adequate.

Where survey has been undertaken for candidate species requiring confirmation of presence or absence, this has been done employing appropriate methods and timing. Nevertheless, it is an unavoidable limitation that not all species that utilise an area will be detected. This is generally due to their cryptic nature or mobility and unpredictable movement throughout their habitat and prevailing drought conditions.

Where survey for candidate species requiring confirmation of presence or absence was not undertaken, this is stated explicitly in the assessment, and measures identified to address the limitation are identified, i.e. assumption of occurrence of the species. This is the case for Greenhood Orchid.

The details of the road upgrade areas were not provided prior to the site surveys and these areas of road upgrade were not surveyed. Vegetation assessment for these areas was undertaken using desktop analysis from aerial imagery, state vegetation mapping and prior knowledge of the site from past surveys. Aerial imagery

indicated most areas of road upgrade were disturbed and not vegetated. Where road widening was to occur though vegetation, areas were assigned PCTS based on the state vegetation mapping and aerial imagery of vegetation condition (whether woodland or derived shrubland). Vegetation condition classes were matched to the vegetation condition score from the same PCTs and Zones from the site surveys.

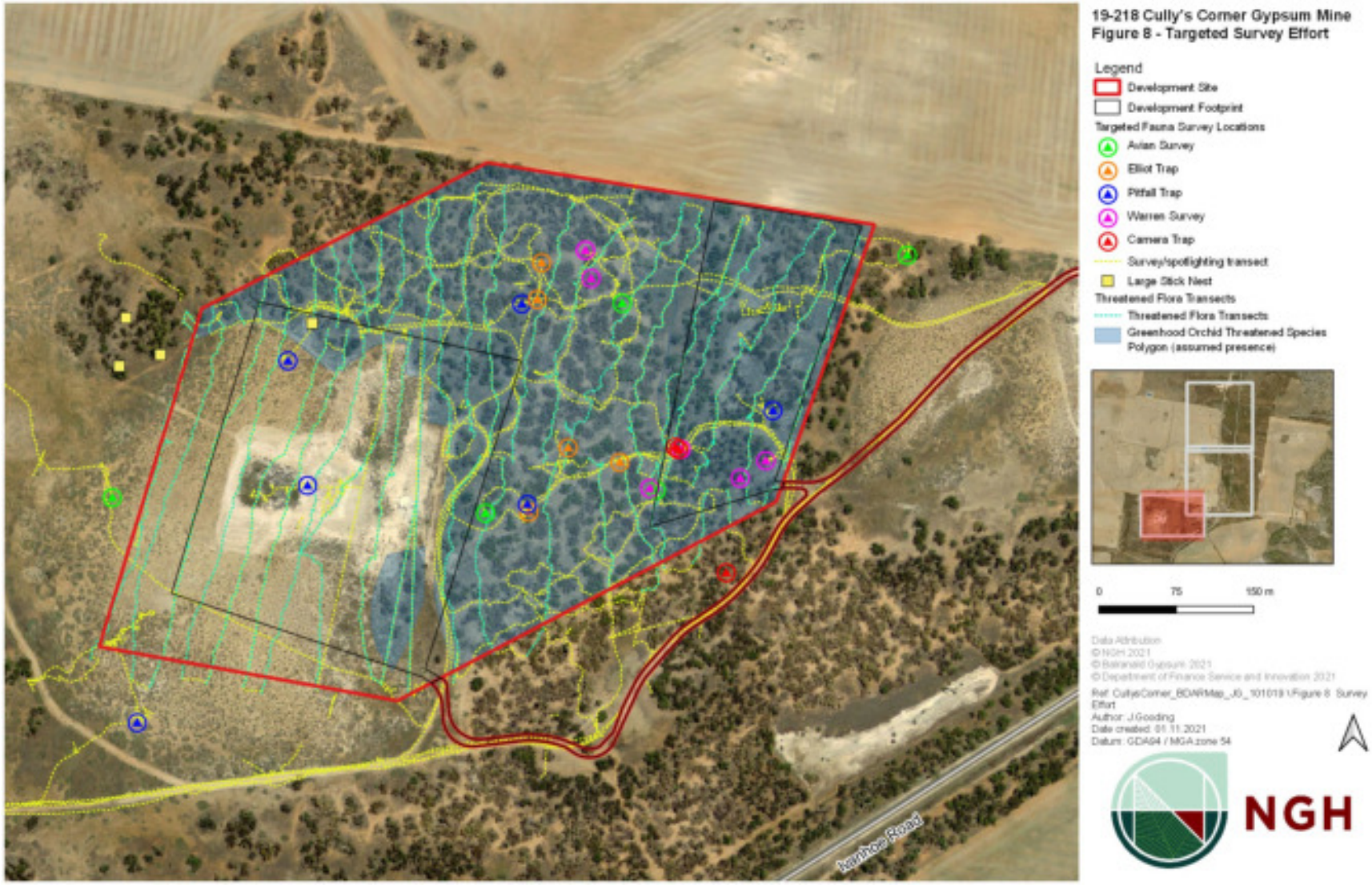


Figure 4-2 Threatened species polygons and targeted survey locations Map 1

Figure 4-3 Survey Effort in the development site Map 2

Figure 4-4 Survey effort in the development site Map 3

5 PRESCRIBED IMPACTS

The following prescribed impacts have been considered;

5.1.1 Occurrences of karst, caves, crevices, cliffs and rocks

As verified by the field inspection, there are no occurrences of karst, caves, crevices, cliffs or rocks in the proposal area.

5.1.2 Occurrences of human made structures and non-native vegetation

As verified by the field inspection, there are no human made structures within the proposal area that could be utilised by threatened species. An existing depression, mined for gypsum, is present within the development footprint however is not considered to form threatened species habitat.

No non-native vegetation was mapped within the proposal area.

5.1.3 Corridors or other areas of connectivity linking habitat for threatened entities

Large tracts of native vegetation runs in a North South direction along Ivanhoe Road connecting landscape features such as Lake Paika to the Murrumbidgee River and Yenga National Park. Extensive areas of native woodland occur to the East and West of the proposal area that provide largescale movement across the landscape.

Species that may use the corridor of vegetation that the development site occurs in are ecosystem species shown in Table 5-1

Table 5-1 Potential fauna species using habitat connectivity

Fauna species	
BIRDS	
Black-breasted Buzzard *Hamirostra melanosternon*	Pied Honeyeater *Certhionyx variegatus*
Chestnut Quail-thrush *Cinclosoma castanotum*	Purple-crowned Lorikeet *Glossopsitta porphyrocephala*
Diamond Firetail *Stagonopleura guttata*	Purple-gaped Honeyeater *Lichenostomus cratitius*
Dusky Woodswallow (eastern subspecies) *Artamus Cyanopterus cyanopterus*	Regent Parrot (eastern subspecies) *Polytelis Anthopeplus monarchoides*
Gilbert's Whistler *Pachycephala inornata*	Scarlet-chested Parrot *Neophema splendida*
Grey Falcon *Falco hypoleucos*	Shy Heathwren *Hylacola cautus*

Fauna species	
Hooded Robin (south-eastern form) *Melanodryas cucullata cucullata*	Southern Scrub-robin *Drymodes brunneopygia*
Little Eagle *Hieraaetus morphnoides*	Spotted Harrier *Circus assimilis*
Major Mitchell's Cockatoo *Lophochroa leadbeateri*	Varied Sittella *Daphoenositta chrysoptera*
Malleefowl *Leipoa ocellata*	
MAMMALS	
Bolam's Mouse *Pseudomys bolami*	Sandy Inland Mouse *Pseudomys hermannsburgensis*
Corben's Long-eared Bat *Nyctophilus corbeni*	Southern Ningaui *Ningaui yvonneae*
Inland Forest Bat *Vespadelus baverstocki*	Striped-faced Dunnart *Sminthopsis macroura*
Kultarr *Antechinomys laniger*	Western Pygmy Possum *Cercartetus concinnus*
Little Pied Bat *Chalinolobus picatus*	Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*
REPTILES	
Mallee Worm-lizard *Aprasia inaurita*	Marble-faced Delma *Delma australis*
Bardick *Echiopsis curta*	Western Blue-tongue Lizard *Tiliqua occipitalis*
Mallee Slender Blue-tongue Lizard *Cyclodomorphus melanops elongatus*	Wedgesnout Ctenotus *Ctenotus brooksi*
Ringed Brown Snake *Pseudonaja modesta*	Yellow-tailed Plain Slider *Lerista xanthura*

5.1.4 Water bodies or hydrological processes that sustain threatened entities

As verified by the field inspection, no hydrological processes that sustain and interact with rivers, streams and wetlands were identified within the proposal area. No permanent or semi-permanent waterbodies occur within the site. Surface water flows are expected to infiltrate the site. The site has not been identified as

'Land subject to flooding' in the Balranald Local Environment Plan (LEP 2010). No man-made dams or hydrological features are present within the proposal area. No threatened entities are considered to rely on hydrological processes within the site.

5.1.5 Vehicle strikes on threatened fauna

There are many vehicle tracks currently occurring within the development site. These are formed or unofficial trails used by farm vehicles or recreational four-wheel driving. The understory of the development site has been heavily damaged from vehicle use. No new roads will be formed by the development however some tracks will be upgraded and widened to cope with larger road trains. Threatened species that may be found along the tracks and road and potentially impacted by vehicle strikes are;

Fauna species	
Ground Dwelling Birds	
Chestnut Quail-thrush Cinclosoma castanotum	Malleefowl Leipoa ocellata
Aerial Birds	
Diamond Firetail Stagonopleura guttata	Purple-gaped Honeyeater Lichenostomus cratitius
Dusky Woodswallow (eastern subspecies) Artamus Cyanopterus cyanopterus	Regent Parrot (eastern subspecies) Polytelis Anthopeplus monarchoides
Gilbert's Whistler Pachycephala inornata	Scarlet-chested Parrot Neophema splendida
Grey Falcon Falco hypoleucos	Shy Heathwren Hylacola cautus
Hooded Robin (south-eastern form) Melanodryas cucullata cucullata	Southern Scrub-robin Drymodes brunneopygia
Little Eagle Hieraaetus morphnoides	Spotted Harrier Circus assimilis
Major Mitchell's Cockatoo Lophochroa leadbeateri	Varied Sittella Daphoenositta chrysoptera
Black-breasted Buzzard Hamirostra melanosternon	Pied Honeyeater Certhionyx variegatus
Purple-crowned Lorikeet Glossopsitta porphyrocephala	
Nocturnal Mammals	
Bolam's Mouse Pseudomys bolami	Sandy Inland Mouse Pseudomys hermannsburgensis
Southern Ningaui Ningaui yvonneae	Striped-faced Dunnart Sminthopsis macroura

Fauna species	
Kultarr Antechinomys laniger	Western Pygmy Possum Cercartetus concinnus
Diurnal Reptiles	
Marble-faced Delma Delma australis	Western Blue-tongue Lizard Tiliqua occipitalis
Ringed Brown Snake Pseudonaja modesta	Yellow-tailed Plain Slider Lerista xanthura
Wedgesnout Ctenotus Ctenotus brooksi	
Nocturnal Reptiles	
Mallee Worm-lizard Aprasia inaurita	Mallee Slender Blue-tongue Lizard Cyclodomorphus melanops elongatus
Bardick Echiopsis curta	

6 MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

An EPBC protected matters report was undertaken on the 18th September 2019 (10 km buffer of the development site) and again on the 6th January 2021 to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the proposal area (APPENDIX C). Relevant to Biodiversity these include:

- Wetlands of International Importance – 4
- Threatened Ecological Communities – 3
- Threatened species – 23
- Migratory species – 9

The potential for these MNES to occur at the site are discussed below.

6.1 WETLANDS OF INTERNATIONAL IMPORTANCE

Four wetlands of international importance were returned from the protected matters report. The nearest of these (within 50 km of the development site) is the Hattah-Kulkyne Lakes. All other wetlands returned from the search are over 200 km away. The Hattah-Kulkyne Lakes occur approximately 100 km south-west of the proposal area. The lakes lie within the Murray-Darling Basin and contains 12 floodplain lakes, these are subject to flooding from the Murray River where flows enter the site predominately from Chalka Creek. The Hattah-Kulkyne Lakes is the most extensive lake system along the Murray River. None of these will be impacted by the proposed development.

6.2 THREATENED ECOLOGICAL COMMUNITIES

Three threatened ecological communities were returned from the protected matters report. No characteristic species of these TECs are present and they are not considered to occur within the development site.

6.3 THREATENED SPECIES

Twenty-three threatened species were returned from the protected matters report. A habitat assessment was undertaken for these species (APPENDIX D) to determine which species would be likely to utilise the development site. From this, four species are considered to have the potential to occur within the development site:

- Grey Falcon (*Falco hypoleucos*) – Vulnerable EPBC Act, Endangered BC Act
- Malleefowl (*Leipoa ocellata*) – Vulnerable EPBC Act, Endangered BC Act
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act, Vulnerable BC Act

Koala (*Phascolarctos cinereus*) – Vulnerable EPBC Act, Vulnerable BC ActImpacts to MNES are discussed in section 8.4

- Migratory Species

Nine listed migratory species were returned from the protected matters report. Based on a habitat assessment (APPENDIX D), none of these species are considered likely to occur at the site on a regular basis or rely on the habitats present.

7 AVOID AND MINIMISE IMPACTS

7.1 AVOIDING AND MINIMISING IMPACTS ON NATIVE VEGETATION AND HABITAT

7.1.1 Site selection – consideration of alternative locations/routes

Gypsum is used in the surrounding agricultural sector and a local source is needed. Gypsum surface deposits were identified in the proposal area. Mining can only occur where gypsum deposits are present. The site was selected as it has had previous mining on the site and has been previously disturbed.

7.1.2 Proposal components – consideration of alternate modes or technologies

Gypsum is a vital resource for use a soil conditioner on agricultural land. Subsurface Gypsum can only be extracted by excavation. The mining process is conducted by scraping overburden (if any), excavating gypsum and processing using a mobile crushing and screening plant and loading onto trucks for transport to sites for agricultural use. No other modes of extraction are possible without disturbing soil.

7.1.3 Proposal planning phase – detailed design

A preliminary constraints analysis was conducted by NGH which informed the site layout design. Vegetation constituting the highest ecological constraints (PCT 171) was avoided where possible. The extractive areas were placed in areas that had previously been disturbed through past mining and grazing. Areas of better-quality remnant woodland were largely avoided. 7.5ha of PCT 171 is retained in the development site and 3.62ha of PCT 170 Woodland is retained in the development site.

The final design footprint is detailed in Figure 7-1

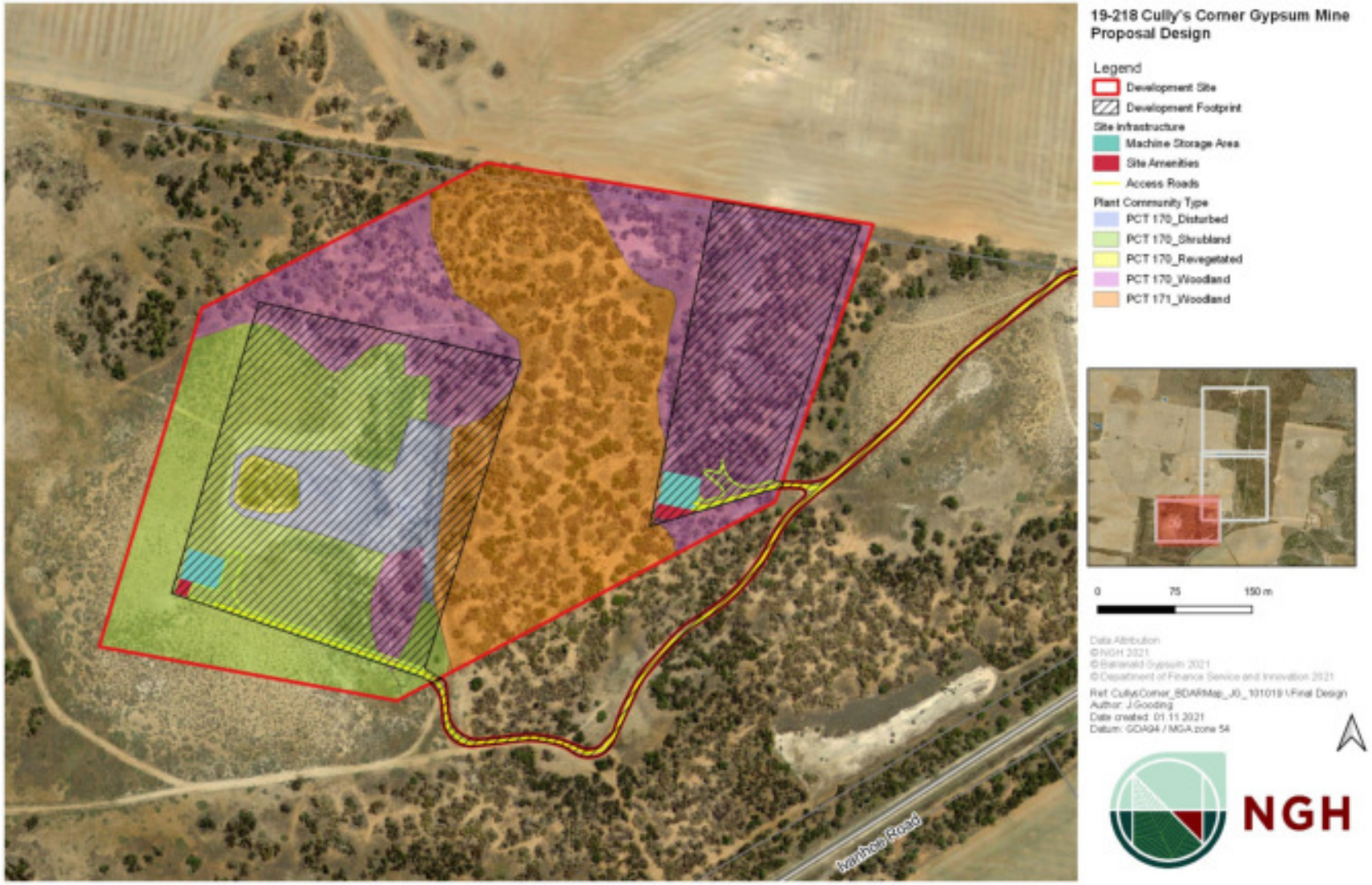


Figure 7-1 Final project footprint Map 1

Figure 7-2 Final Project Footprint Map 2

Figure 7-3 Final Project Footprint Map 3

8 ASSESSMENT OF IMPACTS

8.1 DIRECT IMPACTS

The construction and operational phases of the proposal has the potential to impact biodiversity values at the site that cannot be avoided. This would occur through direct impacts such as habitat clearance and installation and existence of infrastructure. These are summarised in Table 8-1.

Table 8-1 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	Consequence
Direct impacts				
Clearing of native vegetation for extraction areaand site facilities	11.68 ha	Once	Operation phase: 10 years	• Direct loss of native vegetation • Direct loss of native flora and fauna habitat
Clearing of native vegetation for road upgrades	0.18 ha	Once	Operation phase: 10 years	• Direct loss of native vegetation • Direct loss of native flora and fauna habitat
Displacement of resident fauna	11.86 ha	Regular	Operation phase: 10 years	• Direct loss of native fauna • Direct loss of native flora and fauna habitat
Injury or death of fauna	Unknown	Irregular	Operation phase: 10 years	• Direct loss of native fauna
Removal of habitat features e.g. HBTs	Small hollows in mallee woodland	Once	Permanent	• Direct loss of native fauna habitat • Injury and mortality of fauna during clearing of habitat features

8.1.1 Changes in vegetation integrity scores

Around 11.86 ha of native vegetation would be removed or altered by the proposal within the development site. Staged rehabilitation of native vegetation would occur for each of the extraction areas after completion

of the mine in 10 years. Topsoil from the site would be reserved and pushed back onto the extraction area and monitoring and control of weeds will be undertaken. If natural regeneration does not occur then reseeding or replanting of native species would occur. However, as a precautionary approach as the condition of the restored environment is unknown, complete clearing is assumed to occur within each of the vegetation zones. The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in Table 8-2 below.

Table 8-2 Current and future vegetation integrity scores for each vegetation zone within the development site

Zone ID	PCT	TEC and/or threatened species habitat?	Area (ha)	Current vegetation Integrity Score	Future vegetation Integrity Score
1	170_Woodland	No	5.16	55.3	0
2	170_Shrubland	No	4.24	7.1	0
3	170_Disturbed	No	1.54	0.8	0
4	170_revegetated	No	0.29	4.2	0
5	171_woodland	No	0.62	63.6	0
		TOTAL:	**11.86**		

8.1.2 Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing is documented in Table 8-3 below.

Table 8-3 Summary of species credit species loss at the development site

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost
Pterostylis cobarensis Greenhood Orchid	**2**	**5.82 ha (Assumed present)**

8.1.3 Loss of hollow-bearing trees

Vegetation Integrity Plot data indicated an average of 10hollow bearing trees (HBT) per Vegetation Integrity Survey Plot (1000m^2) within woodland areas of PCT 170. Hollows were located in Mallee Trees (*E. socialis, E. gracilis*) which contained numerous small hollows and crevices suitable for microbats or small mammals. Only one large hollow was present within the development footprint.

Based on an average of 10 HBT per 0.1 ha, an estimate ofup to 516 small hollows could be removed by the proposal. These hollows are less than 5cm diameter and suitable for microbats. Based on the same

average of density of HBT – 362 hollows would remain within the development site providing habitat for microbats.

8.2 INDIRECT IMPACTS

Indirect impacts can occur when the proposal or activities relating to the construction or operation of the proposal affect native vegetation, threatened ecological communities or threatened species habitat beyond that of the development site. Indirect impacts of the proposal include soil and water contamination, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. Indirect impacts that must be considered are listed in the BAM. Table 8-4 below details the type, frequency, intensity, duration and consequence of indirect impacts of the proposal. Indirect impact zones are mapped on Figure 8-1.

Table 8-4 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence on biodiversity values
Indirect impacts (those listed below are included in the BAM)					
Inadvertent impacts on adjacent habitat or vegetation	Unknown	Irregular	Operation Phase – 10 years	Ecosystem credit species listed in section 4.1	• Direct loss of native flora and fauna habitat • Potential for injury and mortality of fauna during clearing of fauna habitat and habitat trees • Disturbance to stags, fallen timber, • Increased edge effects The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence
Reduced viability of adjacent habitat due to edge effects	1.9 ha (10m buffer around development footprint)	Constant	Operation Phase – 10 years	Ecosystem credit species listed in section 4.1	• May alter fauna activities or movements • Minor loss of foraging habitat The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Reduced viability of adjacent habitat due to noise, dust or light spill	1.9 ha (10m buffer around development footprint	Irregular	Operation Phase – 10 years	Ecosystem credit species listed in section 4.1	• May alter fauna activities or movements • Minor loss of foraging habitat Operation activities are only undertaken during daytime hours. Extraction methods use only small machinery and the combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Transport of weeds and pathogens from the site to	Unknown	Irregular	Operation Phase – 10 years	Ecosystem credit species listed in section 4.1	• Further degradation of native vegetation and fauna habitat through weed encroachment. The impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence

adjacent vegetation					
Increased risk of starvation, exposure and loss of shade or shelter	Unknown	Rare	Operation Phase – 10 years	Ecosystem credit species listed in section 4.1	Minor Loss of foraging habitat The impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence
Cumulative loss of breeding habitat and competition for remaining resources	Unknown	Rare	Operation Phase – 10 years	Ecosystem credit species listed in section 4.1	Approximately 60% of vegetation has been cleared surrounding the development site. Large tracts of mallee woodland occur within the locality. The impacts are likely to be minor in nature within the locality and would result in a negligible consequence for bioregional persistence.
Trampling of threatened flora species	Unknown	Rare	Operation Phase – 10 years	Greenhood Orchid (assumed to occur)	The impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence.
Inhibition of nitrogen fixation and increased soil salinity	Unknown	Rare	Operation Phase – 10 years	Ecosystem credit species listed in section 4.1	Increased salinity risk from lowering of soil profile resulting in reduced ability for restoration of the site once complete,
Fertiliser drift	None	Absent	n/a	n/a	None
Rubbish dumping	None – no increased access to site.	Absent	n/a	n/a	None
Wood collection	None – no increased access to site.	Absent	n/a	n/a	None

Bush rock removal and disturbance	None – no increased access to site.	Rare	n/a	n/a	None
Increase in predatory species populations	None	Absent	n/a	n/a	None
Increase in pest animal populations	None	Absent	n/a	n/a	None
Increased risk of fire	None	Absent	n/a	n/a	None

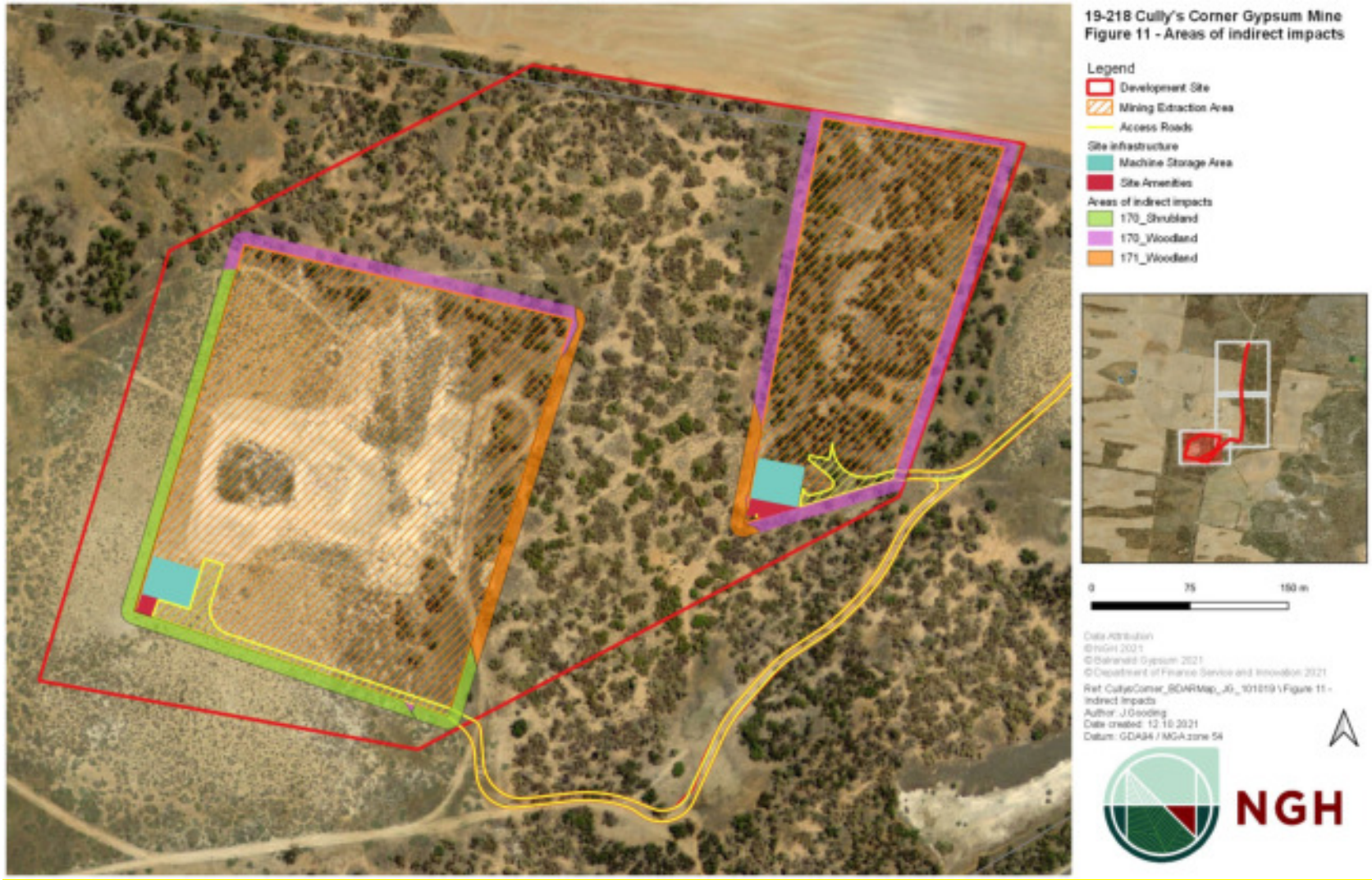


Figure 8-1 Estimated zones of indirect impact for the proposal

8.3 PRESCRIBED IMPACTS

The following prescribed biodiversity impacts are listed in Section 8.3 of the BAM:

8.3.1 Impacts to karst, caves, crevices, cliffs, rocks and other features of geological significance

No karsts, caves, crevices, cliffs or rocks occur within the development site. There would be no impact to these features.

8.3.2 Impacts of development on the habitat of threatened species or ecological communities associated with human made structures

No human made structures associated with threatened species occur within the development site. There would be no impact to these features.

8.3.3 Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

No threatened species associated with non-native vegetation occur within the development site. There would be no impact to these features.

8.3.4 Impacts of development on habitat connectivity

The development site occurs within a large patch of native vegetation that would likely facilitate movement for a number of threatened species (see section 5.1.3) across the landscape.

The patch of native vegetation surrounding the development stie covers an area over 2680 ha. The removal of 11.86 ha of habitat by the proposal would unlikely have a substantial impact on connectivity through the landscape. Connectivity would still be maintained along Ivanhoe road with 300m width of vegetation remaining outside the development site for movement of fauna species. No isolation of habitat would occur.

8.3.5 Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

No permanent or semi-permanent waterbodies occur within the development site.

8.3.6 Impacts of vehicle strikes on threatened species of animals or on animals that are part of a TEC

The proposal would generate the use of up to 5 light vehicle per day and up to 70 B-Double or Road Trains per day at peak use with an average of 21 vehicles per day between the hours of 7:00am to 7:00pm. The site speed limit would be revised as part of a traffic management plan.

Threatened fauna species that could be at risk of collision are listed in Section 5 and include the following groups:

- Ground Dwelling Birds: Ground Dwelling Birds such as the Mallee Fowl could be at risk of vehicle strike as these birds could use the road habitat for traversing across the landscape.
- Aerial Birds: Aerial birds could be at moderate risk of vehicle strike as these birds could inadvertently fly within the path of a vehicle.

- Diurnal Reptiles: Diurnal Reptiles such as the Western Blue Tongue Lizard could be at risk of vehicle strike. However, based on the extensive surrounding shrubland habitat, most of these small reptile species would be using the surrounding vegetation for shelter and protection and would be unlikely to be using the road as habitat. Vehicle strikes could occur if the species are using the road habitat for traversing across the landscape.
- Nocturnal mammals: Nocturnal mammals are at low risk of vehicle strikes as these species would unlikely to be utilising the road habitat during operation hours.
- Nocturnal Reptiles: Nocturnal reptiles are at low risk of vehicle strikes as these species would unlikely to be utilising the road habitat during operation hours.

Based on the low usage of vehicles within the site and slow speed limits designated for a single lane, unsealed road, any vehicles strikes are expected to be low. Any few incidents of vehicle strikes are unlikely to impact on a population of threatened species within the locality.

8.4 IMPACTS TO MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE

8.4.1 Threatened Ecological Communities

No federally listed threatened Ecological Communities would be impacted by the proposal.

8.4.2 Threatened Species

Based on a habitat assessment, four federally listed threatened species could utilise the habitat in the development site. These are;

- Grey Falcon (*Falco hypoleucos*) – Vulnerable EPBC Act
- Malleefowl (*Leipoa ocellata*) – Vulnerable EPBC Act
- Corben's Long-eared Bat (*Nyctophilus corbeni*) – Vulnerable EPBC Act
- Koala (*Phascolarctos cinereus*) – Vulnerable EPBC Act

Grey Falcon, Malleefowl and Corben's Long-eared Bat

Suitable habitat is present for the Grey Falcon, Malleefowl and Corben's Long-eared Bat in the development site. Surveys were not undertaken for these species however, it is considered these species may forage in the development site on occasion. These species are considered in the ecosystem credits for PCT 170 under the BAM.

EPBC Assessments of significance were completed for these two fauna species (APPENDIX E). These concluded that a significant impact was unlikely, on the basis that the proposal would not;

- Lead to a reduction of the size or area of occupancy of a population, or fragment or disrupt the breeding cycle of a population
- Affect habitat critical to the survival of these species
- Affect habitat or introduce disease such that these species would decline
- Introduce invasive species harmful to the species
- Interfere with the recovery of these species.

A referral to the Federal Department of Environment is not considered necessary for these species.

Koala

The EPBC Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is provided as Table 7-5 below as it applies to the proposal. Impact areas that score five or more using the habitat assessment tool contain habitat critical to the survival of the Koala. The assessment in Table 8-5 resulted in a score of 3 and as such habitat within the study area is not considered to be critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is not required.

Table 8-5 Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	
	0 (low)	None of the above.	✓ No records within 10 km of the proposal area. Nearest record over 60km away on the Murray River near Koraleigh
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	✓ Mallee trees not documented as significant food tree
Habitat connectivity	+2	Area is part of a contiguous landscape ≥ 1000 ha.	✓ Proposal area connected to the Murrumbidgee and Yanga

Attribute	Score	Inland	Applicable to the proposal?
	(high)		National Park
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	
	0 (low)	None of the above.	
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	✓ Area scored 0 for Koala occurrence, proposal area is within agricultural landscape likely to have some dog threat. Proposal area is located adjacent to Ivanhoe Road, some vehicle threat present.
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery	✓ Study area is not considered

Attribute	Score	Inland	Applicable to the proposal?
		objectives for the relevant context, as outlined in Table 1.	a habitat refuge nor does it provide important connectivity to large areas surrounding a habitat refuge
Total	**3**	**Decision: Habitat not critical to the survival of the Koala— assessment of significance not required**	

8.4.3 Migratory Species

No migratory species would be impacted by the proposal.

9 MITIGATING AND MANAGING IMPACTS

9.1 MITIGATION MEASURES

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure and an analysis of the consequences of any residual impacts are provided in Table 9-1.

9.1.1 Impacts from the clearing of native vegetation and habitats

1. Timing of works to avoid critical lifecycle events
2. Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or wildlife handler.
3. Relocate habitat features (fallen timber, hollow logs) into retained vegetation patches within the development site.

9.1.2 Indirect impacts

1. Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance.
2. Noise barriers or daily/seasonal timing of construction and operation activities to reduce impacts of noise.
3. Light shields or daily/seasonal timing of construction activities to reduce impacts of light spill.
4. Adaptive dust monitoring programs to control air quality.
5. Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas.
6. Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.

9.1.3 Prescribed impacts

1. Enforce vehicle speed limits with signage and traffic controls to reduce impacts of vehicle strikes on threatened fauna

Table 9-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Direct impacts from the clearing of native vegetation and habitat						
Timing works to avoid critical life cycle events such as breeding or nursing	• All practical measures must be taken to avoid removal of hollow-bearing trees during breeding and hibernation season	Operation	Regular	Hughes Mining	Moderate	Species not detected during pre-clearing surveys may be impacted.
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events	• Pre-clearing checklist • Tree clearing procedure	Operation	Regular	Hughes Mining	Low	Species not detected during pre-clearing surveys may be impacted.
Relocation of habitat features (fallen timber, hollow logs) from within the development site.	• Tree-clearing procedure including relocation of habitat features to adjacent areas within the development site.	Operation	Regular	Hughes Mining	Low	None
Indirect impacts on native vegetation and habitat						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by chainsaw, rather than heavy machinery, is	• Approved clearing limits to be clearly delineated with temporary fencing or similar prior (flagging/bunting) to construction commencing. • No stockpiling or storage within dripline of any mature trees	Operation	Regular	Hughes Mining	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
preferable in situations where partial clearing is proposed	• In areas to clear that are adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise					
noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	• Operational activities to occur during daylight hours only. • Operational Environmental Management Plan will include measures to avoid noise encroachment on adjacent habitats	Operation	Regular	Hughes Mining	Low	None
light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	• Avoid Night Works • Direct lights away from vegetation as far as practicable	Operation	Regular	Hughes Mining	Low	None
adaptive dust monitoring programs to control air quality	• Regular monitoring of dust generated by operation activities • Construction would cease if excessive dust or wind conditions observed being blown from site until control measures were implemented • All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the development site	Operation	Regular	Hughes Mining	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting		Operation	Regular	Hughes Mining	Low	None
hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	• A Weed Management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include: ○ Management protocol for declared priority weeds under the *Biosecurity Act 2015* during and after construction. ○ Weed hygiene protocol in relation to plant, machinery, and fill.	Operation	Regular	Hughes Mining	Low	None
staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Site induction. • Toolbox talks.	Operation	Regular	Hughes Mining	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
making provision for the ecological restoration, rehabilitation and/or ongoing maintenance of retained native vegetation habitat on or adjacent to the development site.	• Rehabilitation of site once mine has ceased operation.	Operation	Regular	Hughes Mining	Low	None
Prescribed biodiversity impacts						
Enforce site speed limits on haulage roads	• Site signage • Traffic controls • Implementation of traffic management plan	Operation	Regular	Hughes Mining	Low	Fauna deaths by vehicle strikes.

9.2 ADAPTIVE MANAGEMENT STRATEGY

Adaptive management during construction and operation will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and is key to the successful implementation of the relevant management plans. This will allow ongoing flexibility to manage objectives, allow for relevant feedback and modifications. Operation management plans will contain management plans for flora and fauna, which will have an adaptive management component. This includes measures to monitor predicted impacts of vehicle strikes, thresholds for species mortality which will trigger adaptive management actions, and any measures proposed to mitigate potential impacts

10 SERIOUS AND IRREVERSIBLE IMPACTS (SAII)

10.1 POTENTIAL SERIOUS AND IRREVERSIBLE IMPACT ENTITIES

No listed SAII entity species or ecological communities occur in the development site. No further entities are considered to comprise a serious and irreversible impact in the development site.

11 IMPACT SUMMARY

11.1 IMPACTS REQUIRING AN OFFSET

11.1.1 Ecosystem credits

An offset is required for all impacts of development on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or

b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or

c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset and the ecosystem credits required are documented in Table 11-1 and mapped on Figure 11-1.

Table 11-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	Zone area (ha)	Vegetation loss	Ecosystem credits required
1	170_Woodland	5.16	55.3	107
2	171_Woodland	0.62	63.6	15

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix F.

11.1.2 Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 11-2.

Table 11-2 Species credit species that require offsets

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost	Species credits required
Pterostylis cobarensis Greenhood Orchid	**2**	**5.82**	**163**

The full Biodiversity Credit Report generated by the BAM Calculator is provided in APPENDIX F.

11.1.3 Offsets required under the EPBC Act

No species listed on the EPBC Act have been identified as having the potential to be significantly impacted by the development. As such, the proposal is not considered to require offsets in accordance with the EPBC Offsets Policy.

11.2 IMPACTS NOT REQUIRING AN OFFSET

Impacts to PCTs that do not meet the thresholds identified in Section 11.1.1 do not require offsets. These PCTs and vegetation zones are identified in Table 11-3 and mapped on Figure 11-1.

Table 11-3 PCTs and vegetation zones that do not require offsets

Zone ID	PCT ID	PCT name	Zone area (ha)	Vegetation integrity score
2	170_Shrubland	Chenopod Sandplain Mallee Woodland/shrubland of the arid and semi-arid (warm) zones	4.24	7.1
3	170_Disturbed	Chenopod Sandplain Mallee Woodland/shrubland of the arid and semi-arid (warm) zones	1.54	0.8
4	170_Revegetated	Chenopod Sandplain Mallee Woodland/shrubland of the arid and semi-arid (warm) zones	0.29	4.2

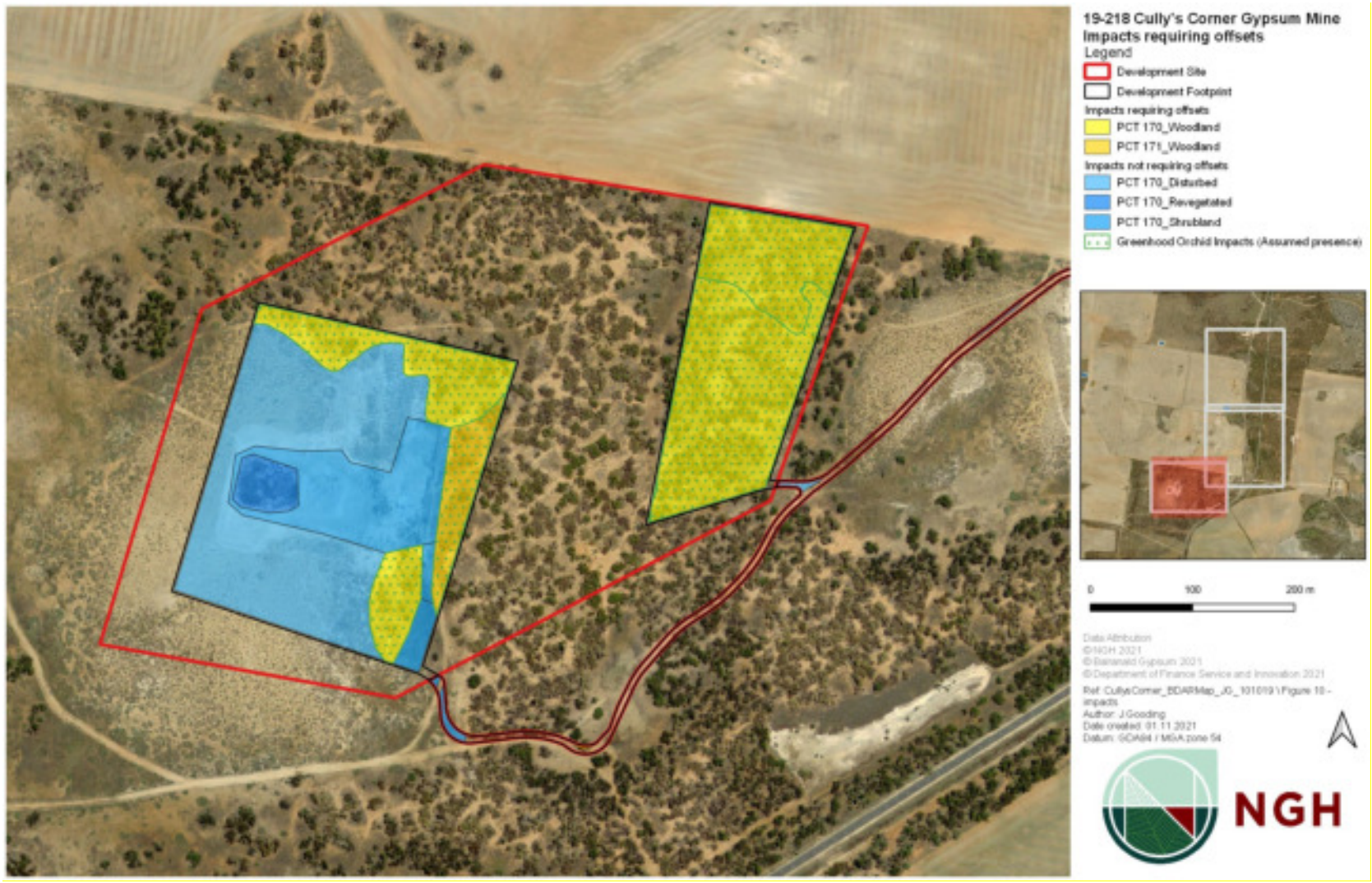


Figure 11-1 Impacts requiring offset, not requiring offset and not requiring assessment Map 1

Figure 11-2 Impacts requiring offsets, not requiring offset and not requiring assessment Map 2

Figure 11-3 Impacts requiring offsets, not requiring offset and not requiring assessment Map 3

12 CONCLUSION

NGH has prepared this BDAR on behalf of Balranald Gypsum for the construction of a Gypsum Mine in Cullys Corner, Balranald. The purpose of this BDAR is to address the requirements of the BAM and to address the biodiversity matters raised in the SEARs.

In this BDAR biodiversity impacts have been assessed through comprehensive mapping and assessment completed for Plant Community types and threatened species habitat,. The proposal design has minimised and avoided impacts to biodiversity where possible. Mitigation measures have been outlined to reduce the impacts to biodiversity.

The Biodiversity credit requirement has been defined as

- 107 Ecosystem Credits for impacts to PCT 170 *Chenopod Sandplain Mallee Woodland/shrubland of the arid and semi-arid zones* within the development site,
- 15 Ecosystem Credits for impacts to PCT 171 *Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion* within the development site,
- 163 Species credits for assumed impacts to Greenhood Orchid (*Pterostylis cobarensis*)

The retirement of these credits must be carried out in accordance with the NSW Biodiversity Offsets scheme and will be achieved by:

(a) Retiring credits under the Biodiversity Offsets Scheme, or

(b) Making payments into the Biodiversity Conservation Fund using the offset payments calculator, or

(c) Funding a biodiversity action that benefits the threatened entity(ies) impacted by the development.

13 REFERENCE LIST

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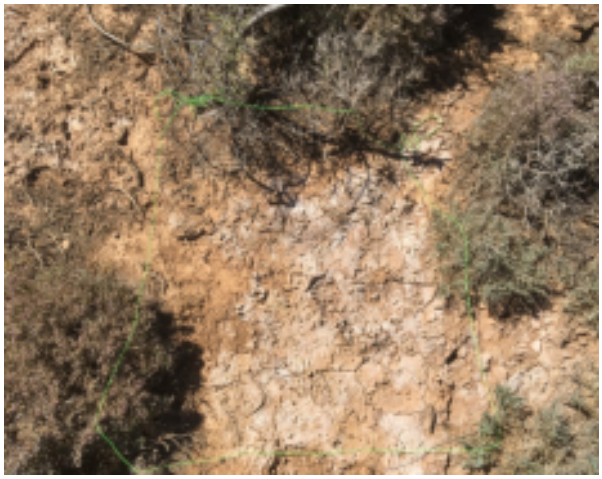
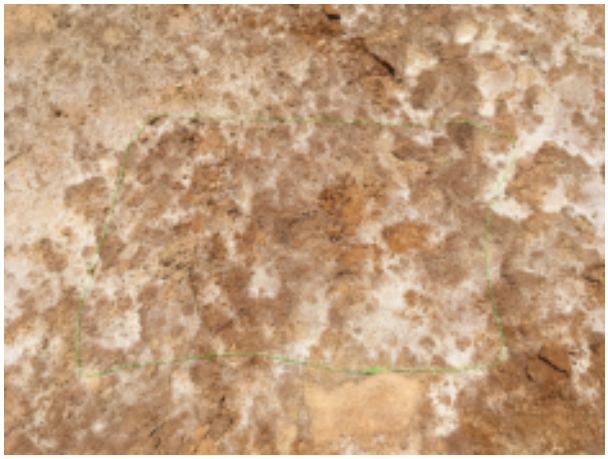
APPENDIX A PLOT FIELD DATA

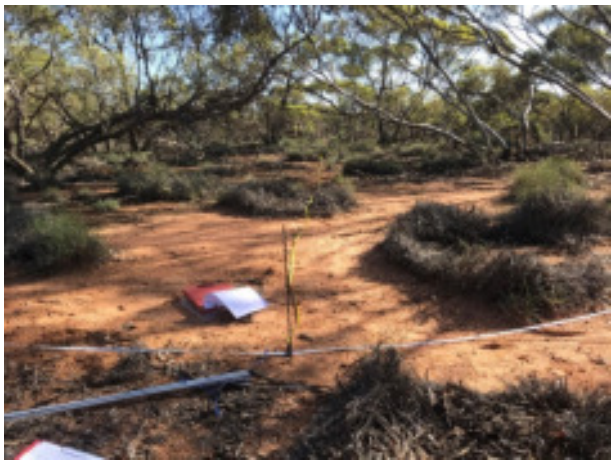
A.1 PLOT PHOTOS

Plot 1	PCT 170_Woodland
	
Plot 2	Plot 171_Woodland
not available (Field Tablet error)	
Plot 3	PCT 170_Woodland

	
Plot 4	PCT 170_Shrubland
	
Plot 5	PCT 170_Shrubland

	
Plot 6	PCT 170_Woodland
	
Plot 7	PCT 170_Disturbed

	
Plot 8	PCT 170_Revegetated
	
Plot 9	PCT 170_Shrubland

	
Plot 10	Plot 171_Woodland
	
Plot 11	Plot 171_Woodland

A.2 FIELD DATA SHEETS

170_Woodland

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders		
Date	24 09 19	Cully's Corner	Disturbed understorey	Julie G + Jessie W		
Zone 55	Datum	Plot ID	1	Plot dimensions	50x20	Photo #
Easting -34.566	Northing 143.576	IBRA region		Midline bearing from 0 m	280°	

Vegetation Class			Confidence: H M L
Plant Community Type	170 Disturbed understorey	EEC:	Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	5
	Grasses etc.	2
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	20.1
	Shrubs	4.6
	Grasses etc.	0.2
	Forbs	2.1
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	𝍸 ✓	4
20 – 29 cm	𝍸 4 ✓	𝍸 2
10 – 19 cm	𝍸 3 ✓	1
5 – 9 cm	1 ✓	
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1, 2, 2, 1.5, 4, 0.5, 1, 0.5, 2, 1, 2, 1.5, 1.5, 4, 4, 1.5, 1, 1, 2, 2	

2, 2, 1.5, 2, 1.5 (46m)

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	98, 30, 45, 35, 98	2, 70, 55, 55, 1	0, 0, 0, 0, 0	0, 0, 0, 0, 0
Average of the 5 subplots	61.2			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

22 start (road)

170 - disturbed understorey

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 24 09 17	Cully Corner	①	JG/JW

GF Code	Top 3 native species in each growth form group: Full species name mandatory. All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
	Small ice plant — Mesembryanthemum	E	0.2	200		
	Barley Grass — Hordeum leporinum nodiflorum	E	0.1	100		
	Sysimbrium. - smooth mustard. crysimoides	E	2%	1000+		
F	Zygophyllum (annual)	N	2%	1000+		
T	Eucalyptus socialis	N	10%	3		
S	Maireana pentatropis	N	0.1	2		
S	Hairy sclerolaena	N	0.1	10		
F	Warrigal Greens — Tetragonia moorei	N	0.1	20		
S	Enchylaena tomentosa	N	0.2	40		
T	Eucalypt seedl.	N	10%	9		
S	Sclerolaena scathing?		4%	1000+		
	Senecio sp.		0.1	2		
G	Grass sp 1		0.1	80		
S	Lacey copperburr — Sclerolaena diacantha	N	0.1	50		
G	Grass 2.		0.1	100		
	~~Maireana brevifolia~~	-	0.1	2		
S	Maireana pyramidata 2 — Maireana pyramidata	N	0.1	2		
	~~Asteraceae~~	-				
	Brassica 1	E	0.1	40		
	20					
	21					
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32 — 60% 40%					
	33					
	34					
	35					
	Disturbed understorey					
	Lots of leaf litter					
	Rabbit diggings					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

171_Woodland

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Zone ID	Recorders
Cully's corner	mod condition	Julie G + Jessie W

Date	24/09/19	Plot ID	2	Plot dimensions	50x20	Photo #	
Zone 55	Datum						
Easting 334·566	Northing 6453·573	IBRA region		Midline bearing from 0 m	80	Magnetic?	
Vegetation Class						Confidence: H M L	
Plant Community Type	PCT 171 Moderate condition			EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	7
	Grasses etc.	3
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	15%
	Shrubs	0.9
	Grasses etc.	30.2
	Forbs	0.2
	Ferns	0
	Other	0
High Threat Weed cover		0.1

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm		
10 – 19 cm	𝍸 𝍸 | | |	
5 – 9 cm	𝍸 𝍸 𝍸 𝍸 𝍸 𝍸 | |	
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2, 1 Tally space	3m

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	3 55 2 89 40	97 4 25 10 60	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	51.4%			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
...ng (identify native/stock)			
...ne			

...nce, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

171 - moderate

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 24 09 19	Cully's corner	(2)	JG/JW

GF Code	Top 3 native species in each growth form group: Full species name mandatory. All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
G	Triodia - porcupine grass — Triodia	N	30%	100		
	African Boxthorn — Lycium ferocissimum	HTE	0.1	1		
S	Rhagodia spinescens	N	0.2	30		
	Dittrichia viscosa	E	0.1	30		
T	Eucalyptus socialis	N	5%	5		
T	Eucalyptus gracilis	N	~~10~~ 15%	~~15~~ 25		
	Brassica sp 1	E	0.1	40		
G	Grass sp. 1		0.1	20		
F	Zygophyllum aurwal	N	0.1	2		
S	Maireana pyramidata	N	0.2	1		
S	Grey copperburr — Sclerolaena diacantha	N	0.1	10		
S	Star copperburr — Sclerolaena ~~diacantha~~ patenticuspis	N	0.1	2		
G	Lomandra sp	N	0.1	1		
	~~Ruby saltbush (Enchylaena tomentosa)~~	—				
S	Ruby saltbush — Enchylaena tomentosa	N	0.1	1		
F	Lily sp. — Dianella glochidiata		0.1	10		
S	Acacia (grazed) — Acacia brachybotrya	N	0.1	1		
S	Sandalwood ?) - seedling — Dissocarpus?	N	0.1	1		
	incidental: olearia pimeleoides					
	Eremophila sp.					
	Lomandra sp.					
	Red Sandy soil					
	Rabbit digging					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

40% of 50

170 - Woodland

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	24 9 19	Cuiley's Corner	Shrubby understorey	Julie G. + Jessie W			
Zone 55	Datum	Plot ID	3	Plot dimensions	50x20	Photo #	
Easting 34.564	Northing 143.571	IBRA region		Midline bearing from 0 m	310		
Vegetation Class						Confidence: H M L	
Plant Community Type	PCT 170 Shrubby understorey			EEC:		Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	1
	Shrubs	9
	Grasses etc.	1
	Forbs	6
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	8.1
	Shrubs	6.1
	Grasses etc.	0.1
	Forbs	0.7
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm		
20 – 29 cm	11 ✓	
10 – 19 cm	𝍸 𝍸 111 ✓	111
5 – 9 cm	111 ✓	
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	1, 1 5, 2, 2, 2 5, 3, 1 5, 1, 1, 1, 1 5, 1, 1, 1	20m

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	10 50 25 5 5	90 50 75 95 95	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	19%			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

170 - shrubby understory

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 24 09 19	cullyoorna	3	JG

GF Code	Top 3 native species in each growth form group: Full species name mandatory. All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
S	Enchylaena tomentosa	N	0.3	30		
S	Maireana pyramidata	N	5%	10		
S	Maireana (large flowers) Maireana georgei	N	0.1	1		
T	Eucalyptus sociabilis	N	8%	4		
S	Sclerolaena muricata	N	0.1	1		
S	Lycium ferocissimum Sclerolaena decantha	N	0.1	40		
	Dysphania erysimoides	E	0.2	300		
	Brassica sp. 1	E	0.1	40		
F	Zygophyllum (small)	N	0.2	200		
	Annual Medic ~~Medic~~ Medicago sp.	E	0.1	20		
	Barley Grass Hordeum leporinum	E	0.1	20		
F	Asteraceae White bottom	N	0.1	10		
S	Sclerolaena seedling	N	0.2	200		
F	Calotis	N	0.1	20		
G	Grass 1	N	0.1	5		
F	Oxalis (perennans?)	N	0.1	2		
S	Eremophila seedling	N	0.1	2		
S	Maireana pentatropis	N	0.1	1		
S	Prickly saltwort Salsola australis	N	0.1	10		
F	Jamga/green Tetragonia moorei	N	0.1	10		
F	Zygophyllum (shrub) Zygophyllum aurantiacum	N	0.1	1		
	22					
	23					
	24					
	25					
	26					
	27					
	28					
	29					
	30					
	31					
	32					
	33					
	34					
	35					
	36 Red sandy soil.					
	37 Bare ground					
	38 disturbance from vehicle track					
	Lots of Rabbit Diggings and Rabbit Poo					
	40					

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

45 Lots

170 - Shrubland

BAM Site – Field Survey Form

Site Sheet no: 1 of

Survey Name	Zone ID	Recorders
Cully's Corner	Derived chenopod Shrubland	Julieh + Jessie W

Date	24/09/19	Plot ID	4	Plot dimensions	5x20	Photo #	
Zone 55	Datum	IBRA region		Midline bearing from 0 m	225 Magnetic		
Easting	Northing						

Vegetation Class			Confidence: H M L
Plant Community Type	PCT 170 - Derived chenopod Shrubland	EEC:	Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	5
	Grasses etc.	1
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	14.3
	Grasses etc.	0.1
	Forbs	0.2
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	0	
50 – 79 cm	0	
30 – 49 cm	0	
20 – 29 cm	0	
10 – 19 cm	0	
5 – 9 cm	0	
< 5 cm	0	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0m Tally space	

Counts apply when the **number of tree stems** within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30...., 100, 200, 300....). For a **multi-stemmed tree**, only the largest living stem is included in the count/estimate. **Tree stems must be living.**

For **hollows**, count only the presence of a stem containing hollows. For a **multi-stemmed tree**, only the largest stem is included in the count/estimate. **Stems may be dead and may be shrubs.**

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	15 0 0 1 25	8 100 99 99 25	0 0 0 0 0	0 0 0 0 0
Average of the 5 subplots	8.2%			

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour		Soil Depth	
Slope		Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date		A	

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable		N, E or HTE	Cover	Abund	stratum	voucher
	Barley Grass	Hordeum leporinum	E	5%	1000+		
	Red Brome	Bromus sp.	E	5%	1000+		
S	Samphire	Tecticornia	N	10%	100		
S	Maireana pyramidata	Maireana georgei	N	0.2	2		
S	Maireana - large pink flowers		N	2%	40		
	Small ice plant	Mesembryanthem	E	5%	1000+		
F	Atriplex lindleyi		N	0.1	30		
	Burr Medic	Medicago sp	E	5%	1000+		
	Sow thistle	sonchus oleraceus	E	0.1	1		
	Geranium (white flower)	Erodium cicutarium	E	0.1	10		
G	Austrostipa ~~scabra~~	(Austrostipida (nuhida)	N	0.1	1		
S	Bluebush	Nitraria billardierei	N	2%	10		
S	Maireana sp 2	Maireana appressa	N	0.1	5		
F	Tetragonia	Tetragonia moorei	N	0.1	1		
	Red Brown clay loam						
	Many Rabbit diggings						

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form	Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	05 12 19	Balranald [illegible]	[illegible]	Jessie [illegible] + D. Bambrick			
Zone 54	Datum GDA 94	Plot ID	5	Plot dimensions	20x50	Photo #	
Easting 735713	Northing 6171884	IBRA region	Murray Darling Depression	Midline bearing from 0 m	39° E		
Vegetation Class		Chenopod shrubland				Confidence: H M L	
Plant Community Type		170 - shrubland			EEC:	Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	4
	Grasses etc.	~~1~~ 0
	Forbs	~~3~~ 1
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	30.3
	Grasses etc.	~~0.1~~ 0
	Forbs	~~0.1~~ 0.1
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm	–	–
50 – 79 cm	–	–
30 – 49 cm	–	–
20 – 29 cm	–	–
10 – 19 cm	–	–
5 – 9 cm	–	–
< 5 cm	–	n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	–	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30 ... 100, 200, 300 ...). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	1 | 5 | 5 | 1 | 0	95 | 80 | 20 | 75 | 60	0 | 0 | 1 | 0 |	0 | 0 | 0 | 0 | 0
Average of the 5 subplots	1.8	78	0.2	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture	Red sandy soil	Soil Colour	[illegible]	Soil Depth	
Slope	Flat	Aspect		Site Drainage		Distance to nearest water and type	

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing (inc. logging)			
Cultivation (inc. pasture)			
Soil erosion			
Firewood / CWD removal			
Grazing (identify native/stock)			
Fire damage			
Storm damage			
Weediness			
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	05 12 19	Botanical Assessment	5	J. Whiteley + D. Cunningham

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
S	Tecticornia ~~spp.~~ sp.	N	20	200		
F	~~Atriplex~~ Einadia nutans	N	0.1	100		
~~F~~	Medicago ~~spp.~~ sp.	E	0.1	1000's		
S	Maireana ~~spp.~~ sp.	N	0.2	500		
~~G~~	Bromus madritensis	E	0.1	500		
~~F~~	Mesembryanthemum crystallinum	E	0.5	100		
S	Atriplex ~~spp.~~ sp.	N	0.1	5		
S	Lycium australe	N	1.0	1		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ... 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no:

		Survey Name	Zone ID	Recorders			
Date	06 12 19	Belmont Gypsum mine	Woodland	J. Wheeldon + D. Bentford			
Zone 54	Datum GDA94	Plot ID	6	Plot dimensions	50x20	Photo #	
Easting 786376	Northing 6172207	IBRA region	Murray Darling Depression	Midline bearing from 0 m	252° W		
Vegetation Class						Confidence: H M L	
Plant Community Type		170 - woodland - chenopod understorey			EEC:	Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	2
	Shrubs	3
	Grasses etc.	~~3~~ 1
	Forbs	2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	40
	Shrubs	23
	Grasses etc.	~~0.50~~ 0.1
	Forbs	0.2
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000 m² plot) DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	III	III
20 – 29 cm	~~IIII~~ ~~IIII~~ ~~IIII~~ III	~~IIII~~ ~~IIII~~ III
10 – 19 cm	✓ present	~~IIII~~ ~~IIII~~ I
5 – 9 cm	✓ present	
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	2+3+2+2+2+2+3 Total = 16 m	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30, … 100, 200, 300, …). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	70	95	95	[illegible]	20	29	4	2	5	20	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	77					12					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern	[illegible]	Microrelief	
Lithology		Soil Surface Texture	loamy	Soil Colour	[illegible] with [illegible]	Soil Depth	10cm
Slope	~4°	Aspect		Site Drainage	well sloping	Distance to nearest water and type	200+ m

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing (inc. logging)			~~Absent~~ Absent in plot, car tracks, adjacent to plot
Cultivation (inc. pasture)			Absent
Soil erosion			Absent
Firewood / CWD removal			Absent
Grazing (identify native/stock)			present native (kangaroo) and stock (sheep) + Rabbits
Fire damage			Absent
Storm damage			Absent
Weediness			Low
Other			NA

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date: 6/12/19	Balranald Gypsum	6	J. Whelan & D. Bambrick

GF Code	*Top 3 native species in each growth form group: Full species name mandatory. All other native and exotic species: Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
T	Eucalyptus gracilis	N	20	15		
S	Maireana tripter a	N	0.2	100		
S	Bassia quinquecuspis	N	2	2		
T	Eucalyptus socialis	N	20	15		
F	Atriplex nummularia	N	0.1	5		
S	Bassia obliquicuspis	N	0.1	50		
G	Austrostipa scabra	N	0.1	1		
F	Atriplex lindleyi	N	0.1	2		
G	Bromus arenitensis	E	0.1	100		
G	Hordeum leporinum	E	0.1	100		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form

Site Sheet no:

Date	5 12 19	Survey Name: CC	Zone ID: Disturbed	Recorders: DB JW	
Zone: 54	Datum:	Plot ID: Plot 1	Plot dimensions: 20x50	Photo #:	
Easting: 235914	Northing: 6171008	IBRA region: Murray Darling depression	Midline bearing from 0 m: 330 NW		
Vegetation Class	Shrubland			Confidence: H M L	
Plant Community Type	170		EEC:	Confidence: H M L	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	3
	Grasses etc.	~~2~~ 1
	Forbs	~~5~~ 2
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	2.2
	Grasses etc.	0.1
	Forbs	~~0~~ 0.2
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	Absent	
20 – 29 cm	Shrubland	
10 – 19 cm	no trees in plot	
5 – 9 cm		
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30 … 100, 200, 300 …). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)	Bare ground cover (%)	Cryptogam cover (%)	Rock cover (%)
Subplot score (% in each)	0, 5, 0, 5, 1	99, 50, 99, 60, 95	0, 0, 0, 0, 0	0, 0, 1, 0, 0
Average of the 5 subplots	2.2	80.6	0	0

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour	cream	Soil Depth	
Slope		Aspect		Site Drainage	in depression	Distance to nearest water and type	200 m

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)			cleared for gypsum mine
Cultivation (inc. pasture)			Absent
Soil erosion			present
Firewood / CWD removal			absent
Grazing (identify native stock)			present, kangaroo, goat, sheep
Fire damage			Absent
Storm damage			Absent
Weediness			Low - Moderate
Other			NA

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _	Survey Name	Plot Identifier	Recorders
Date 06 12 19	[illegible]	7	[illegible]

GF Code	*Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable*	N, E or HTE	Cover	Abund	stratum	voucher
S	Tecticornia ~~spp~~ sp.	N	2	50		
S	Audasipa drummondii	N	0.1	5		
~~G~~	Bromus madritensis	E	2	300		
F	Sida ~~spp~~. sp.	N	0.1	20		
~~F~~	Mesembryanthemum Carpobrotus	E	0.2	100		
~~F~~	Medicago ~~spp~~. sp.	E	0.2	[illegible]		
S	Frankenia foliosa	N	0.1	1		
S	Maireana ~~spp~~. sp.	N	1	50		
F	Unidentified Asteraceae 1	N	0.1	3		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site – Field Survey Form	Site Sheet no:

		Survey Name	Zone ID	Recorders		
Date	06 12 19	[illegible]	Reveg	JW DB		
Zone 54	Datum	Plot ID	8	Plot dimensions	50x20	Photo #
Easting 735895	Northing 6172041	IBRA region	Murray Darling Depression	Midline bearing from 0 m	248W	
Vegetation Class	Shrubland					Confidence: H M L
Plant Community Type	170 - Shrubland Revegetated			EEC:		Confidence: H M L

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m² plot)		Sum values
Count of Native Richness	Trees	0
	Shrubs	1
	Grasses etc.	0
	Forbs	0
	Ferns	0
	Other	0
Sum of Cover of native vascular plants by growth form group	Trees	0
	Shrubs	60
	Grasses etc.	0
	Forbs	0
	Ferns	0
	Other	0
High Threat Weed cover		0

BAM Attribute (1000 m² plot)		
DBH	# Tree Stems Count	# Stems with Hollows
80 + cm		
50 – 79 cm		
30 – 49 cm	Absent	
20 – 29 cm	shrubland	
10 – 19 cm	trees no	
5 – 9 cm	plot within	
< 5 cm		n/a
Length of logs (m) (≥10 cm diameter, >50 cm in length)	0	

Counts apply when the number of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30 … 100, 200, 300 …). For a multi-stemmed tree, only the largest living stem is included in the count/estimate. Tree stems must be living.

For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)					Bare ground cover (%)					Cryptogam cover (%)					Rock cover (%)				
Subplot score (% in each)	5	5	10	5	30	95	90	5	5	2	0	0	0	0	0	0	0	0	0	0
Average of the 5 subplots	11					39.4					0					0				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography + site features that may help in determining PCT and Management Zone (optional)

Morphological Type		Landform Element		Landform Pattern		Microrelief	
Lithology		Soil Surface Texture		Soil Colour	white + brown	Soil Depth	
Slope	flat	Aspect		Site Drainage	[illegible]	Distance to nearest water and type	[illegible]

Plot Disturbance	Severity code	Age code	Observational evidence
Clearing (inc. logging)			Previously cleared for agriculture, now re-veg
Cultivation (inc. pasture)			Absent
Soil erosion			Absent
Firewood / CWD removal			Absent
Grazing (identify native/stock)			Present, [illegible]
Fire damage			Absent
Storm damage			Absent
Weediness			Absent
Other			NA

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

400 m² plot: Sheet _ of _		Survey Name	Plot Identifier	Recorders
Date	06 12 19	Cullys Corner	8	JW + DB

GF Code	Top 3 native species in each growth form group: Full species name mandatory All other native and exotic species: Full species name where practicable	N, E or HTE	Cover	Abund	stratum	voucher
S	Tecticornia spp.	N	60	800+		

GF Code: see Growth Form definitions in Appendix 1 **N:** native, **E:** exotic, **HTE:** high threat exotic **GF – circle code** if 'top 3'.

Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover); ***Note:*** *0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m*

Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

BAM Site Field Survey

Project:	Cully's Corner	**Plot 9**		**Pic 20x20**		**Pic 20x50**		
Survey date:	12.11.2020		**Compass Orientation (head of 20x20 plot)**				314°	
Recorders	BP/ LH		**PCT:**	171				
GPS Easting	185432	**GPS Northing**	6169537		**Datum**	490	**Zone**	Shrubland
Landform			**Soils**			**Drainage & Slope**		
Morphology	sedimentary		**Soil Texture**	sandy clay		**Slope**	2°	
LandF Element	alluvial		**Soil Colour**	brown		**Aspect**	west	
LandF Pattern	flat		**Soil Depth**			**Drainage**	poor	
Microrelief	nil		**Geology**			**Watercourses**		

Plot Disturbance

	Severity	Age	Observational Evidence
Clearing	0		
Cultivation	0		
Soil erosion	0		
Firewood	0		
Grazing	1	R	Sheep droppings
Fire Damage	0		
Storm Damage	0		
Weediness	0		
Other	0		

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Dominant Species outside Plot

FUNCTION

Function attributes for	0

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	4
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	9

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	0
	Shrub (SG)	30.3
	Forb (FG)	1.1
	Grass & grasslike (GG)	0.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	31.5
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)	0		

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

BAM Attributes (1 x 1m Plots)			
	Tape length	% cover	Average %
Litter Cover	5m	5%	3.8%
	15m	2%	
	25m	5%	
	35m	2%	
	45m	5%	
Bare ground cover	5m	70%	65.2%
	15m	68%	
	25m	65%	
	35m	78%	
	45m	45%	
Cryptogam cover	5m	0%	0.0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	
Rock Cover	5m	0%	0.0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	

COMPOSITION & STRUCTURE

Species recorded for		0						
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**
tect perg	*Tecticornia pergranulata*		Chenopodiaceae	30	50		Shrub (SG)	No
mese nodi	*Mesembryanthemum nodiflorum*	Small Ice Plant	Aizoaceae	2	300	*		No
sals aust	*Salsola australis*		Chenopodiaceae	0.1	1		Shrub (SG)	No
green forb	*Unidentified forb*			0.8	100		Forb (FG)	No
calo	*Calotis sp.*		Asteraceae	0.1	10		Forb (FG)	No
aira	*Aira spp.*	A Hairgrass	Poaceae	0.1	100	*		No
Small succulent	*Unidentified forb*			0.1	10	#N/A	Forb (FG)	No
scle diac	*Sclerolaena diacantha*	Grey Copperburr	Chenopodiaceae	0.1	6		Shrub (SG)	No
pani	*Panicum spp.*	Panicum	Poaceae	0.1	10		Grass & grasslike (GG)	No
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiaceae	0.1	15		Shrub (SG)	No
hord	*Hordeum spp.*	A Barley Grass	Poaceae	0.2	100	*		No
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
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	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE
	#N/A	#N/A	#N/A			#N/A		FALSE

BAM Site Field Survey								
Project:	Cully's Corner	**Plot Identifier**	10	**Pic 20x20**		**Pic 20x50**		
Survey date:	12.11.2020		**Compass Orientation (head of 20x20 plot)**				32°	
Recorders	BP/ LH		**PCT:**	171				
GPS Easting	185674	**GPS Northing**	6169762		**Datum**	490	**Zone**	Mallee woodland/Spinifex
Landform			**Soils**			**Drainage & Slope**		
Morphology	sedimentary		**Soil Texture**	sandy		**Slope**	2°	
LandF Element	slope		**Soil Colour**	brown/orange		**Aspect**	North	
LandF Pattern			**Soil Depth**			**Drainage**	poor	
Microrelief	nil		**Geology**			**Watercourses**		

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	0		
Cultivation	0		
Soil erosion	0		
Firewood	0		
Grazing	0		
Fire Damage	0		
Storm Damage	0		
Weediness	1	NR	Dandylion (Sonckus sp.)
Other	0		

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

Age class of trees (DBH range) , Condition of Vegetation, Hollows

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

Dominant Species outside Plot	

FUNCTION

Function attributes for	10

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	3
	Forb (FG)	2
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	0
	TOTAL	10

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	45
	Shrub (SG)	0.5
	Forb (FG)	0.2
	Grass & grasslike (GG)	25.2
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	70.9
	TOTAL 'HTE'	0.1

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	3	0	0
5-9	22	0	0
<5	3	0	N/A
Length of logs (m)	0		

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	50%	32.4%	
	15m	25%		
	25m	75%		
	35m	2%		
	45m	10%		
Bare ground cover	5m	40%	63.0%	
	15m	75%		
	25m	25%		
	35m	95%		
	45m	80%		
Cryptogam cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0.0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	10								
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**
Trio scar	*Triodia scariosa*	Porcupine Grass	Poaceae	25	50		Grass & grasslike (GG)	No	
Euca soci	*Eucalyptus socialis*	Red Mallee	Myrtaceae	20	4		Tree (TG)	No	
Euca grac	*Eucalyptus gracilis*	Snap and Rattle	Myrtaceae	25	3		Tree (TG)	No	
Scle diac	*Sclerolaena diacantha*	Grey Copperburr	Chenopodiace	0.1	3		Shrub (SG)	No	
Sals aust	*Salsola australis*		Chenopodiace	0.1	23		Forb (FG)	No	
Sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	2	*		No	
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.2	10		Shrub (SG)	No	
pani	*Panicum spp.*	Panicum	Poaceae	0.1	5		Grass & grasslike (GG)	No	
Geij parv	*Geijera parviflora*	Wilga	Rutaceae	0.2	4		Shrub (SG)	No	
Mair cili	*Maireana ciliata*	Fissure Weed	Chenopodiace	0.1	1		Forb (FG)	No	
aira	*Aira spp.*	A Hairgrass	Poaceae	0.1	1	*		No	
hord vulg	*Hordeum vulgare*	Barley	Poaceae	0.1	1	*		No	
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	1	*		HTE	
aust	*Austostipa sp.*	A Spear grass	Poaceae	0.1	1		Grass & grasslike (GG)	No	

BAM Site Field Survey								
Project:	Cully's Corner	**Plot Identifer**	11	**Pic 20x20**		**Pic 20x50**		
Survey date:	12.11.2020		**Compass Orientation (head of 20x20 plot)**				13°	
Recorders	BP/ LH		**PCT:**	171				
GPS Easting	185633	**GPS Northing**	6169948		**Datum**	GDA 94	**Zone**	55
Landform			**Soils**			**Drainage & Slope**		
Morphology	sedimentary		**Soil Texture**	sandy		**Slope**	0°	
LandF Element	valley		**Soil Colour**	orange		**Aspect**	flat	
LandF Pattern	valley		**Soil Depth**			**Drainage**		
Microrelief	small indetations		**Geology**			**Watercourses**		

Plot Disturbance			
	Severity	**Age**	**Observational Evidence**
Clearing	0		
Cultivation	0		
Soil erosion	0		
Firewood	0		
Grazing	1	NR	old sheep droppings
Fire Damage	0		
Storm Damage	0		
Weediness	1	NR	
Other	0		

Severity: 0 = no evidence, 1=light, 2=moderate, 3=severe **Age:** R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Additional information

Current land use

vacant land in industrial zone

Age class of trees (DBH range) , Condition of Vegetation, Hollows

mature and regrowth possible hollows mod condition

Disturbances (i.e. fire, grazing,ferals, clearing, logging, soil degradation, pollution, weeds, dieback)

as above

Significant and threatened species and communities (Note pop. size/area, structure, repro status, habit, habitat, threats, photos)

none

Dominant Species outside Plot

FUNCTION

Function attributes for	11

BAM Attribute (20x20m plot)		
Count of Native Richness	Stratum	Sum
	Tree (TG)	2
	Shrub (SG)	5
	Forb (FG)	6
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	15

BAM Attribute (20x20m plot)		
Count of cover abundance (native vascular plants)	Stratum	Sum
	Tree (TG)	10.5
	Shrub (SG)	0.8
	Forb (FG)	0.6
	Grass & grasslike (GG)	5.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	17
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	14	0	0
5-9	14	0	0
<5	6	0	N/A
Length of logs (m)	2		

0.1%=63x63cm
0.5%=1.4x1.4m
1%=2×2m
5%=4×5m
25%=10×10m

BAM Attributes (1 x 1m Plots)			
	Tape length	% cover	Average %
Litter Cover	5m	5%	68.0%
	15m	90%	
	25m	80%	
	35m	80%	
	45m	85%	
Bare ground cover	5m	70%	26.0%
	15m	10%	
	25m	15%	
	35m	20%	
	45m	15%	
Cryptogam cover	5m	0%	0.0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	
Rock Cover	5m	0%	0.0%
	15m	0%	
	25m	0%	
	35m	0%	
	45m	0%	

COMPOSITION & STRUCTURE

Species recorded for	11							
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**
Thys baue	*Thysanotus baueri*	Fringe-lily	Anthericaceae	0.1	12		Forb (FG)	No
aust	*Austrostip ap*		Poaceae	0.1	50		Grass & grasslike (GG)	No
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.1	30		Shrub (SG)	No
scle diac	*Sclerolaena diacantha*	Grey Copperburr	Chenopodiace	0.4	50		Shrub (SG)	No
trio scar	*Triodia scariosa*	Porcupine Grass	Poaceae	5	10		Grass & grasslike (GG)	No
Sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	1	5	*		No
Zygo	*Zygophyllum spp.*		Zygophyllacea	0.1	20		Forb (FG)	No
sals aust	*Salsola australis*		Chenopodiace	0.1	2		Forb (FG)	No
sonc	*Sonchus spp.*	Sowthistle	Asteraceae	0.1	10	*		No
Euca soci	*Eucalyptus socialis*	Red Mallee	Myrtaceae	10	7		Tree (TG)	No
Bras	*Brassica spp.*	Brassica	Brassicaceae	0.1	20	*		No
Mair	*Maireana spp.*	Cotton Bush, Bluebush, Fissure-	Chenopodiace	0.1	10		Shrub (SG)	No
Euca grac	*Eucalyptus gracilis*	Snap and Rattle	Myrtaceae	0.5	1		Tree (TG)	No
Scle	*Sclerolaena sp*		Chenopodiace	0.1	8		Shrub (SG)	No
Mair	*Maireana spp.*	Cotton Bush, Bluebush, Fissure-	Chenopodiace	0.1	1		Shrub (SG)	No
ptil	*Ptilotus spp.*		Amaranthace	0.1	3		Forb (FG)	No
Mair cili	*Maireana ciliata*	Fissure Weed	Chenopodiace	0.1	2		Forb (FG)	No
vitt	*Vittadinia spp.*	Fuzzweed	Asteraceae	0.1	1		Forb (FG)	No

APPENDIX B FAUNA SPECIES LIST

Common Name	Latin Name	Observation Type
Birds		
Inland Thornbill	*Acanthiza apicalis*	O
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	H
Australian Ringneck Parrot	*Barnardius zonarius barnardi*	O
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	O
Australian Magpie	*Cracticus tibicen*	O/H
Grey Butcherbird	*Cracticus torquatus*	O/H
Welcome Swallow	*Hirundo neoxena*	O
Superb Fairywren	*Malurus cyaneus*	O
Cockatiel	*Nymphicus hollandicus*	O
Crested Pigeon	*Ocyphaps lophotes*	O/H
Striated Pardalote	*Pardalotus striatus*	H
Weebill	*Smicrornis brevirostris*	O/H
Grey Currawong	*Strepera versicolor*	H
Mammals		
***European Rabbit**	**Oryctolagus cuniculus*	O/S
Eastern Grey Kangaroo	*Macropus giganteus*	O
Short-beaked Echidna	*Tachyglossus aculeatus*	O/P
***Red Fox**	**Vulpes vulpes*	S/T

Reptiles		
Southern Rock Dtella	*Gehyra lazelli*	O/P
Beaded Gecko	*Lucasium damaeum*	O/P
Shingleback	*Tiliqua rugosa*	O/P
Barking Gecko	*Underwoodisaurus milii*	O/P
Lace Monitor	*Varanus varius*	O (Deceased)

Observed =O, Heard = H, Photographed = P, Scat = S, Tracks = T

APPENDIX C EPBC PROTECTED MATTERS SEARCH

Australian Government

Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

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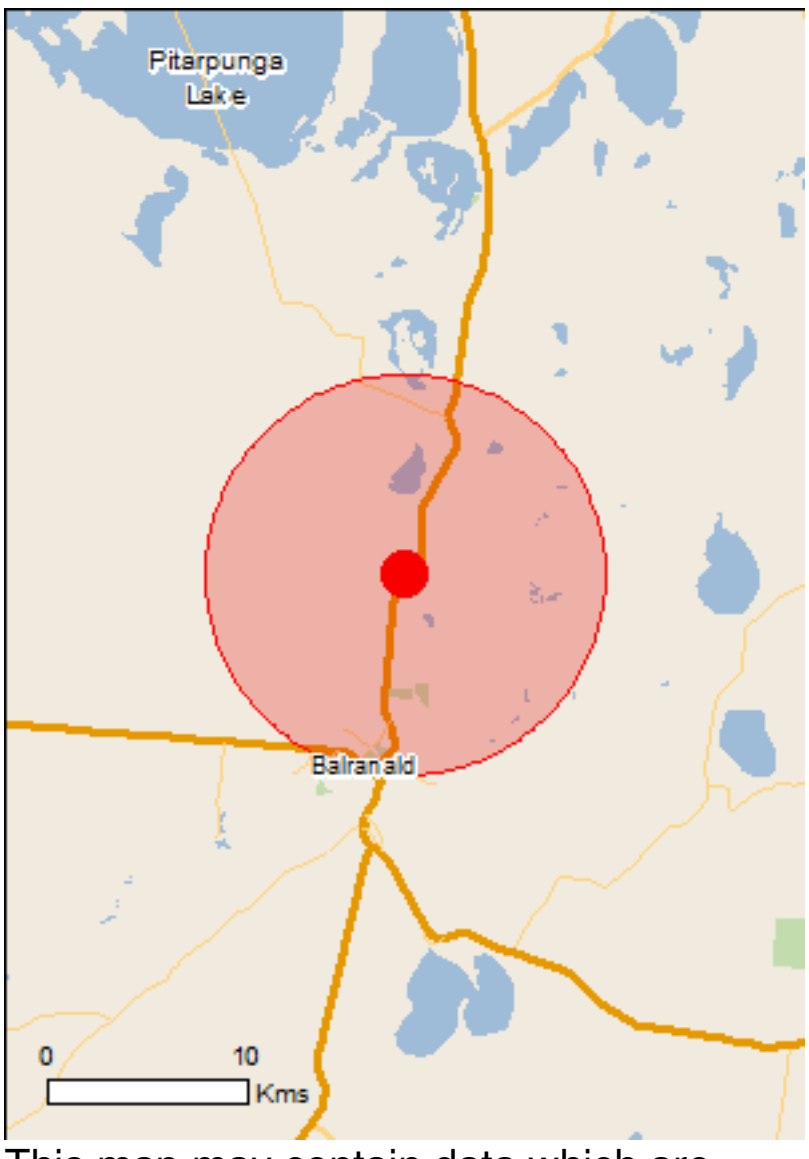

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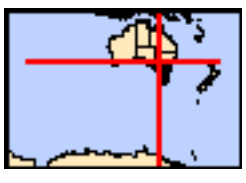

Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	23
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	2
Regional Forest Agreements:	None
Invasive Species:	20
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	200 - 300km upstream
Hattah-kulkyne lakes	50 - 100km upstream
Riverland	200 - 300km upstream
The coorong, and lakes alexandrina and albert wetland	300 - 400km upstream

Listed Threatened Ecological Communities		[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Buloke Woodlands of the Riverina and Murray-Darling Depression Bioregions	Endangered	Community may occur within area
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia	Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community may occur within area

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta		
Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pedionomus torquatus		
Plains-wanderer [906]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis		
Night Parrot [59350]	Endangered	Extinct within area
Rostratula australis		
Australian Painted Snipe [77037]	Endangered	Species or species

Name	Status	Type of Presence
		habitat known to occur within area
Fish		
Craterocephalus fluviatilis Murray Hardyhead [56791]	Endangered	Species or species habitat may occur within area
Galaxias rostratus Flathead Galaxias, Beaked Minnow, Flat-headed Galaxias, Flat-headed Jollytail, Flat-headed Minnow [84745]	Critically Endangered	Species or species habitat may occur within area
Maccullochella macquariensis Trout Cod [26171]	Endangered	Species or species habitat may occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
Macquaria australasica Macquarie Perch [66632]	Endangered	Species or species habitat may occur within area
Frogs		
Litoria raniformis Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Mammals		
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat may occur within area
Plants		
Austrostipa metatoris [66704]	Vulnerable	Species or species habitat may occur within area
Brachyscome papillosa Mossgiel Daisy [6625]	Vulnerable	Species or species habitat likely to occur within area
Lepidium monoplocoides Winged Pepper-cress [9190]	Endangered	Species or species habitat likely to occur within area
Solanum karsense Menindee Nightshade [7776]	Vulnerable	Species or species habitat likely to occur within area
Swainsona murrayana Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area
Reptiles		
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Migratory Terrestrial Species		
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land - Australian Telecommunications Commission

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba Great Egret, White Egret [59541]		Breeding known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Chrysococcyx osculans Black-eared Cuckoo [705]		Species or species habitat likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Rostratula benghalensis (sensu lato) Painted Snipe [889]	Endangered*	Species or species habitat known to occur within area

Extra Information

State and Territory Reserves	[Resource Information]
Name	State
Southern Mallee	NSW
Yanga	NSW

Invasive Species	[Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
Mammals		
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus Goat [2]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Carrichtera annua Ward's Weed [9511]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur

Name	Status	Type of Presence within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-34.56649 143.57806

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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APPENDIX D EPBC HABITAT ASSESSMENT

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
Flora					
A spear-grass *Austrostipa metatoris*	Grows in sandy areas of the Murray Valley in habitats including sand hills, sand ridges, undulating plains, and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils.		Present Sand ridges and mallee woodland in development site	Unlikely. Not detected in targeted surveys.	No Not detected within development site.
Mossgiel Daisy *Brachyscome papillosa*	Recorded primarily in clay soils on Bladder Saltbush and Leafless Bluebush plains, but also in grassland and in Inland Grey Box – Cypress Pine woodland.	2	Absent Clay soils, Bladder Saltbush plains or Grey Box – Cypress Pine woodlands not present in development site.	Unlikely No suitable habitat	No No suitable habitat
Winged Pepper-cress	Occurs predominantly in mallee scrub in semi-arid areas. Sites are seasonally moist to water-logged with heavy, fertile soils. Predominant		Present	Unlikely.	No.

[1] Information sourced from species profiles on NSW OEH's threatened species database or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.

BCD threatened species database: http://www.threatenedspecies.environment.nsw.gov.au/index.aspx
SPRAT: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
Lepidium monoplocoides	vegetation is usually an open woodland dominated by Allocasuarina luehmannii or Eucalypts, particularly *Eucalyptus largiflorens* or *Eucalyptus populnea* with tussock grasses. Does not tolerate grazing disturbance.		Mallee woodland in development site	Not detected in targeted surveys.	Not detected within development site.
Menindee Nightshade *Solanum karsense*	Grows in occasionally flooded depressions with heavy soil, including level river floodplains of grey clay with Black Box and Old Man Saltbush, and open treeless plains with solonised brown soils. Habitats are generally lake beds or floodplains of heavy grey clays with a highly self-mulching surface. Also found on sandy floodplains and ridges and in calcareous soils, red sands, red-brown earths and loamy soils.	6	Absent River floodplains, heavy soils or Black Box Woodlands not present in development site.	Unlikely. Not detected in targeted surveys.	No. Not detected within development site.
Slender Darling Pea *Swainsona murrayana*	Has been collected from clay-based soils, ranging from grey, red, and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including Bladder Saltbush, Black Box, and grassland communities on level plains, floodplains, and depressions and is often found with *Maireana* species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated.		Absent Clay soils and associated vegetation not present in development site.	Unlikely. Not detected in targeted surveys.	No. Not detected within development site.
Ecological Communities					
Bulloke Woodlands of the Riverina and Murray-Darling Depression Bioregion	Bulloke woodlands EEC occurs widely across these bioregions, in patches within open forests or woodlands where there are clay or alkaline subsoils.		Absent. Characteristic species not present.	Unlikely Study area within known distribution of ecological community, though survey did not record	No. Not present within development site..

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
				characteristic spp.	
Grey Box (*Eucalyptus microcarpa*) grassy woodlands and derived Native Grasslands of South-eastern Australia	Inland Grey Box Woodland is characterised by the dominance of Inland grey box (*Eucalyptus macrocarpa)* often found in association with bimble box (*E. populnea* subsp. *Bimbil)*, while cypress pine (*Callitris glaucophylla)*, kurrajong (*Brachychiton populneus*), bulloak (*Allocasuarina luehmannii*), yellow box (*E. melliodora)* and white box (*E. albens*). A variable ground layer of grass and herbaceous species is present at most sites, while a shrub middle story layer is sparse or absent.		Absent. Characteristic species not present.	Unlikely Study area within known distribution of ecological community, though survey did not record characteristic spp.	No. Not present within development site.
Weeping Myall Woodlands	The structure of the community varies from sparse woodland to low open woodland dominated by *Acacia pendula* (Weeping Myall or Boree), which may or may not be the only tree species present. The understorey includes an open layer of chenopod shrubs and other woody plant species and an open to continuous groundcover of grasses and herbs.		Absent. Characteristic species not present.	Unlikely Study area within known distribution of ecological community, though survey did not record characteristic spp.	No. Not present within development site.
Birds					
Australasian Bittern	Favour permanent freshwater wetlands with tall, dense vegetation, particularly bulrushes (*Typha* spp.) and spike-rushes (*Eleocharis* spp.).		Absent	Unlikely	No

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
Botaurus poiciloptilus			Favoured riparian vegetation absent from study area.	Development site within known distribution of species however no suitable habitat.	No suitable habitat would be impacted by the proposal.
Curlew Sandpiper *Calidris ferruginea*	Littoral and estuarine habitats and in NSW is known to be found in intertidal mudflats of sheltered coasts. This migratory wetland species can be found foraging on the edge of shallow water, on exposed algal mats or on banks of beach cast seagrass or seaweed.		Absent No coastal or estuarine habitat in development site.	Unlikely Development site within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Grey Falcon *Falco hypoleucos*	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast. Also occurs near wetlands where surface water attracts prey.		Present	Possible	**Yes** **Assessment of Significance undertaken.**
Painted Honeyeater *Grantiella picta*	Painted Honeyeaters occur in Boree/Weeping Myall, Brigalow, and Box-Gum Woodlands and Box-Ironbark Forests.		Absent No preferred foraging habitat in development site	Unlikely Development site within known distribution of species however no	No No suitable habitat would be impacted by the proposal.

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
				suitable habitat.	
Malleefowl *Leipoa ocellata*	Inhabits mallee communities. Utilises mallee with a with a spinifex understorey, but usually at lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species. Prefers areas of light sandy to sandy loam soils and habitats with a dense but discontinuous canopy and dense and diverse shrub and herb layers.	11	Present Mallee Woodlands present within development site	Possible Development site within known distributions	**Yes** **Assessment of Significance undertaken.**
Eastern Curlew *Numenius madagacariensis*	Suitable habitat for this migratory wetland species includes most of Australia's coastline. Breeding occurs in China, returning to Australia in August to feed on crabs and molluscs in intertidal mudflats.		Absent No mudflat of wetland forage habitat in development site	Unlikely Development site within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Plains-wanderer *Pedionomus torquatus*	Plains-wanderers are found in semi-arid, lowland native grasslands on hard red-brown soils, in a typical habitat structure of 50% bare ground, 10% fallen litter, and 40% herbs, forbs, and grasses.		Absent Grasslands absent from development site	Unlikely Development site within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
Night Parrot Pezoporus occidentalis	A highly elusive nocturnal ground dwelling parrot found in the arid and semi-arid zones of Australia; it is one of only three ground-dwelling parrots in Australia. Inhabits spinifex grasslands in stony or sandy areas and samphire and chenopod associations on floodplains, salt lakes and clay pans. Suitable habitat is characterised by the presence of large clumps of spinifex.		Present	Unlikely Presumed extinct within area	No Unlikely to occur
Australian Painted Snipe *Rostratula australis*	Fringes of swamps, dams and nearby marshy areas with cover of grasses, low scrub or open timber. Permanent and ephemeral shallow (<50 cm) wetlands and waterbodies or inundated grassland and paddocks.		Absent No swamps, wetland or waterbodies in study area.	Unlikely Development site within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Mammals					
Corben's Long-eared Bat *Nyctophilus corbeni*	Variety of vegetation types, most commonly Mallee, Bulloke, and Box-dominated communities, but are most common in vegetation which has a distinct canopy and dense understorey. They roost in tree hollows, crevices, and under loose bark.		Present Mallee Woodlands within development site	Unlikely Development within known distribution of species.	**Yes Assessment of Significance undertaken.**
Koala *Phascolarctos cinereus*	Range of eucalypt forest and woodland communities, including coastal forests, the woodlands of the tablelands and western slopes, and the riparian communities of the western plains.		Present Food trees present within study area but in low density	Possible Study area within known distribution of species.	No Koala habitat Assessment Tool undertaken (Section 7.4.2)

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
Frogs					
Southern Bell Frog *Litoria raniormis*	Only known to occur in isolated populations in Coleambally Irrigation Area, Lowbidgee floodplain, and around Lake Victoria. Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps or billabongs along floodplains and river valleys, and in irrigated rice crops where there is no available natural habitat.	2	Absent No Black Box/Lignum/Nitre goosefoot swamp, billabongs or rice crops in study area.	Unlikely Study area within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Fish					
Murray Hardyhead *Craterocephalus fluviatilis*	Mostly recorded in saline lakes that are moderately acidic to highly alkaline and have relatively low turbidity. Margins of lakes, wetlands, backwaters, and billabongs. Open water, shallow, slow-flowing or still habitats, with sand or silt substrates. Also, deeper habitats with dense aquatic vegetation.		Absent No lakes, backwaters, billabongs with deep water.	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
Flathead Galaxias *Galaxias rostratus*	Inhabits running inland waters including the southern part of the Murray Basin. Have also been recorded in the Macquarie, Lachlan and Murrumbidgee river systems. Flathead Galaxias prefer still or slow-flowing habitats including billabongs, lakes, swamps, and rivers.		Absent No rivers or streams within the development site	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
Trout Cod *Maccullochella macquariensis*	Areas with large in-stream woody debris.		Absent No rivers or streams within the development site	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
Murray Cod *Maccullochella peeli*	Murray Cod occur in a wide range of warm water habitat including clear rocky streams, slow flowing turbid rivers, and billabongs. The upper reaches of the Murray and Murrumbidgee Rivers are considered too cold to be suitable habitat. They are usually found near complex structural cover such as large rocks, woody debris, and overhanging vegetation, and is most frequently found in the main river channel and larger tributaries but can occasionally occur in floodplain channels during floods.		Absent No rivers or streams within the development site	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
Macquarie Perch *Macquaria australasica*	Macquarie Perch are found in rivers, clear, deep, rocky holes with plenty of cover including aquatic vegetation, large boulders, large woody debris, and overhanging banks. Previously recorded, particularly in the upstream reaches, of the Lachlan, Murrumbidge and Murray Rivers.		Absent No rivers or streams within the development site	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
Reptiles					
Striped Legless Lizard *Delma impar*	Limited to grassland: Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass *Themeda australis*, spear-grasses *Austrostipa* spp. and poa tussocks *Poa* spp., and occasionally wallaby grasses *Austrodanthonia* spp. White Box-Yellow Box-Blakely's Red Gum Grassy Woodland is one preferred plant type community.		Absent Minimal grassland within development site.	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
Migratory Marine Birds					
Fork-tailed Swift *Apus pacificus*	This migratory marine species is a non-breeding visitor to Australia and has been recorded in all regions of NSW, mainly over inland plains. Habitat in Australia is almost exclusively aerial from 1m to 1000m. Most observed over inland plains in Australia, but sometimes recorded over coastal cliffs and beaches as well as urban areas. Has been recorded well out to sea as well as from offshore islands	3	Present Aerial species with resilience to vegetation variation.	Possible Development site within known or predicted	No Aerial species. No suitable habitat would be impacted by the proposal.

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
				distribution of species.	
	Migratory Wetland Species				
Common sandpiper *Actitis hypoleucos*	This migratory wetland species is found along all Australian coastlines and many inland areas. They are active birds that will pursue invertebrates over rocks. Breeding habitat is mainly in Europe.		Absent No coastal or rocky habitat in development site.	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
Sharp-tailed Sandpiper *Calidris acuminata*	This migratory wetland species wades mud in estuarine habitats feeding on invertebrates. They are widespread throughout much of NSW but are sparse in the south-central and lower western regions. Breeding habitat is in Northern Siberia.		Absent No estuarine wetland habitat in development site.	Unlikely No suitable habitat.	No No suitable habitat would be impacted by the proposal.
Curlew Sandpiper *Calidris ferruginea*	Littoral and estuarine habitats and in NSW is known to be found in intertidal mudflats of sheltered coasts. This migratory wetland species can be found foraging on the edge of shallow water, on exposed algal mats or on banks of beach cast seagrass or seaweed.		Absent No coastal or estuarine habitat in development site.	Unlikely No suitable habitat.	No No suitable habitat would be impacted by the proposal.
Pectoral Sandpiper *Calidris melanotos*	In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands		Absent No freshwater wetlands within development site	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
Latham's Snipe *Gallinago hardwickii*	This migratory wetland species is a non-breeding visitor to much of eastern Australia. Distribution is naturally fragmented as preferred habitat including freshwater wetlands occur in patches.		Absent No freshwater wetlands within development site	Unlikely No suitable habitat	No No suitable habitat would be impacted by the proposal.
Eastern Curlew *Numenius madagascariensis*	Suitable habitat for this migratory wetland species includes most of Australia's coastline. Breeding occurs in China, returning to Australia in August to feed on crabs and molluscs in intertidal mudflats.		Absent No mudflat of wetland forage habitat in development site	Unlikely Development site within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Migratory Terrestrial Species					
Yellow wagtail *Motacilla flava*	This migratory terrestrial species migrates from Africa to Australia in summer and breeds in Europe. Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Non-breeding habitat only: mostly wellwatered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation.		Absent No wetlands, mangroves or grassy open flat within development site.	Unlikely Development site within known distribution of species however no suitable habitat.	No No suitable habitat would be impacted by the proposal.
Satin Flycatcher *Myiagra cyanoleuca*	This migratory terrestrial species is found in Australia, Indonesia and Papua New Guinea. The species inhabits moist lowland forests and tropical forests over the eastern half of NSW. They are particularly		Present Woodland within development site	Unlikely Development site not	No

Species	Description of habitat[1]	Number of known records within 10km (Bionet)	Presence of habitat	Likelihood of occurrence	Possible impact?
	common in tall wet sclerophyll forest, often in gullies or along water courses. In woodlands they prefer open, grassy woodland. The diversity of occupied habitats expands during migration, with the species recorded in most wooded habitats			within core range.	Unlikely to occur within development site.
E EPBC = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.* *V EPBC = listed as Vulnerable under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999.* M EPBC = listed as Migratory under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*			CE EPBC = listed as Critically Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.* CAMBA = Chinese-Australia Migratory Bird Agreement JAMBA = Japan-Australia Migratory Bird Agreement ROKAMBA = Republic of Korea–Australia Migratory Bird Agreement		

APPENDIX E EPBC ASSESSMENT OF SIGNIFICANT IMPACT

The *Environment Protection and Biodiversity Conservation Act* 1999 specifies factors to be taken into account in deciding whether a development is likely to significantly affect EECs, threatened species and migratory species, listed at the Commonwealth level. The following assessments assesses the significance of the likely impacts associated with the proposed works on:

VULNERABLE SPECIES

Grey Falcon (*Falco hypoleucos*) - V

Corben's Long-eared Bat (*Nyctophilus corbeni*) – V.

Malleefowl (*Leipoa ocellata*) – V.

Under the EPBC Act (DOE, 2013) an important population of a species is defined as a population that is necessary for a species long term survival and recovery. This may include populations identified in recovery plants and/or are;

- Key source populations either for breeding or dispersal
- Populations that are necessary for maintaining genetic diversity
- Populations that are near the limit of the species range

Table 13-1 Assessment of significance for vulnerable species

Vulnerable Species (Superb Parrot & Painted Honeyeater)
a) Will the action lead to a long-term decrease in the size of an important population of a species?
Grey Falcon
No known records of the Grey Falcon occur within the development site and avian surveys did not detect the species or breeding habitat in the development site. The nearest known records occur approximately 10 km north near Paika Lake. The development site is not considered known breeding habitat but provides potential foraging habitat. Grey Falcons are highly mobile and can forage over large distances. They are distributed over most of the Australian Continent (DAWE 2021). The development site is not part of a core breeding area, an area of isolated genetic diversity, or an area at the limit of the species range for the Grey Falcon. Thus, an important population is not considered to occur in the development site and no impact are anticipated to the size of an important population of Grey Falcon.
Corben's Long-eared Bat
No known records or populations of Corben's Long-eared Bat occur within the development site. The nearest known records occurs in private property approximately 10km to the West. The development site is not considered known habitat but presence of Mallee trees and small hollows provides potential foraging and roosting habitat for this species. The development site is not part of a key management site listed by OEH (OEH, 2017b), a core breeding area, an area of isolated genetic diversity, or an area at the limit of the species range thus

an important population is not considered to occur in the development site and no impacts are anticipated to an important population of Corben's Long-eared Bat.

Malleefowl

No known records or populations of Malleefowl occur within the development site. Surveys did not detect the species or breeding mounds within the development site. The nearest known record occurs approximately 5km to the west of the development site with numerous records occurring in private property 10km to the West. The development site is not considered known breeding habitat but provides potential foraging habitat.

The development site is not part of a key management site listed by OEH (OEH 2017c), a core breeding area, an area of isolated genetic diversity, or an area at the limit of the species range for the Malleefowl. Thus, an important population is not considered to occur in the development site and no impact are anticipated to the size of an important population of Malleefowl.

b) Will the action reduce the area of occupancy of an important population of the species?

Grey Falcon

Up to 11.86 ha of foraging habitat would be removed by the proposal however as an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy for an important population of Grey Falcon. The broader proposal area will continue to contain suitable areas of foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.

Corben's Long-eared Bat

Up to 11.86 ha of foraging and breeding habitat would be removed by the proposal however as an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy for an important population of Corben's long eared Bat. The broader proposal area will continue to contain suitable areas of foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.

Malleefowl

Up to 11.86 ha of foraging habitat would be removed by the proposal however as an important population is not considered to occur within the development site, the action is not considered to reduce the area of occupancy to an important population of Malleefowl. The broader proposal area will continue to contain suitable areas of foraging habitat of a sufficient size and quality to maintain individuals of the species within the proposal area and the wider locality.

c) Will the action fragment an existing important population into two or more populations?

Grey Falcon

As the individuals of the species is not considered to form an important population in the development site, the action is not considered to fragment an existing important population. As the Grey Falcon is a highly mobile aerial species, the proposal will not impact on its movement across the development site or surrounding landscape.

Corben's Long-eared Bat

As the individuals of the species are not considered to form an important population, the action is not considered to fragment an existing important population. As the species is a highly mobile aerial species, the proposal will not impact on its movement across the development site or surrounding landscape.

Malleefowl

As the species are not considered to form an important population in the development site, the action is not considered to fragment an existing important population. Continuity of vegetation would remain surrounding the development site and the proposal would not impact on movement for this species through the surrounding landscape.

d) Will the action adversely affect habitat critical to the survival of a species?

Grey Falcon, Corben's Long eared Bat

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for these protected species. The proposed development is not located near any critical habitat for the species listed on the register. There are no recovery plans for these species and thus no Critical habitat is identified in a recovery plan.

Malleefowl

The Register of Critical Habitat established under the EPBC Act does not list any critical habitat for these protected species. The proposed development is not located near any critical habitat for the species listed on the register. Habitat Critical for survival is defined in the national recovery plan as arid to semi-arid shrublands and mallee woodlands with a sandy substrate and abundance of leaf litter (Benshemesh, J., 2007)

e) Will the action disrupt the breeding cycle of an important population of the species?

Grey Falcon

Grey Falcons typically nest in tall trees of River Red Gum and Coolibah Trees or tall man-made towers between June and November (TSSC, 2020). No suitable breeding habitat was observed in the development site and no known important population is considered to occur within the proposal area. Thus, the action would not disrupt the breeding cycle of an important population.

Corben's Long-eared Bat

Corben's Long-eared Bat nests in tree hollows and crevices. An estimate of approximately 590 small tree hollows (<5cm diameter) would be removed by the proposal, however no known important population is considered to occur within the proposal area. Clearing of tree hollows would avoid the breeding season between Spring to Summer.

Malleefowl

Malleefowl incubate eggs in large mounds of sandy soils. No breeding habitat was observed in the development site and no known important population is considered to occur within the proposal area. Thus, the action would not disrupt the breeding cycle of an important population.

f) Will the action modify, destroy, remove, isolate or decrease the availability of quality habitat to the extent that the species is likely to decline?
Grey Falcon
The proposal will remove approximately 11.86 ha of woodland vegetation in the development site. Approximately 1020 ha of similar habitat would remain adjacent to the development site that would continue to provide suitable foraging habitat. This modification and removal of habitat is not considered likely to decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.
Corben's Long-eared Bat
The proposal will remove approximately 11.86 ha of woodland vegetation in the development site, which includes an estimate of 590 small hollows less than 5cm diameter. Approximately 1020 ha of similar habitat would remain adjacent to the development site in the locality. This modification and removal of habitat is not considered likely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.
Malleefowl
The proposal will remove approximately 11.86 ha of woodland vegetation in the development site. Approximately 1020 ha of similar habitat would remain adjacent to the development site in the locality. This modification and removal of habitat is not considered likely to decrease the availability or quality of habitat to the extent that the species is likely to decline, as extensive habitat will remain in the locality.
g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?
Grey Falcon
Predation by cats is listed as a key threat in Grey Falcon Conservation Advice for the species (TSSC, 2020). The proposal will modify the current land use, potentially creating additional shelter habitat for predatory invasive species such as foxes and cats, which are considered likely to be locally prevalent regardless of the proposal. Management protocols will be prepared and implemented as part of the Biodiversity Management Plan for the proposal which will monitor and manage these species within the development site.
h) Will the action introduce disease that may cause the species to decline?
Grey Falcon
The proposal is not considered to act as a vector for any diseases to the Grey Falcon.
Corben's Long-eared Bat
The proposal is not considered to act as a vector for any diseases to the Corben's Long-eared Bat.
Malleefowl

The proposal is not considered to act as a vector for any diseases to the White-throated Needletail.

i) Will the action interfere substantially with the recovery of the species?

Grey Falcon

No recovery plan has been developed for the Grey Falcon. Key priority actions listed in Conservation Advice for the species include;

- support improved fire and grazing management in areas where Grey Falcons are known to occur.
- Protect known nesting trees and include adequate exclusion buffers with regard to proposed developments and land clearing activities.
- Support the establishment and survival of replacement nest trees in areas where Grey Falcon in known to breed.
- Retain artificial structures with known or potential Grey Falcon nests.
- Control invasive cats and camels in areas where Grey Falcons are known to occur, especially in known roosting and nesting areas.

The proposal would not contradict the key priority actions so would be unlikely to interfere substantially with the recovery of the species.

Corben's Long-eared Bat

No recovery plan has been developed for the Corben's Long-eared Bat.

Malleefowl

The recovery plan for the Malleefowl lists 7 objectives for management of populations

- Reduce permanent habitat loss
- Reduce the threat of grazing pressure on Malleefowl populations
- Reduce fire threats
- Reduce predation
- Reduce isolation of fragmented populations
- Promote Mallefowl friendly agricultural practices
- Reduce Malleefowl mortality on roads

The proposal may reduce habitat to a small degree (11.86 ha) but in the context of the remaining vegetation in the locality, the proposal would not substantially interfere with any recovery objectives.

Conclusion

A significant impact to these species is considered unlikely, on the basis that the proposal would not:

- Lead to a reduction of the size or area of occupancy of an important population, or fragment or disrupt the breeding cycle of a population.
- Affect habitat critical to the survival of these species.
- Affect habitat or introduce disease such that these species would decline.
- Introduce invasive species harmful to the species.
- Interfere with the recovery of these species.

A referral to the Federal Department of Environment is not considered necessary.

APPENDIX F BAM CALCULATOR CREDIT REPORTS

These are only valid for 2 weeks following the "Report Created" date.

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017880/BAAS18074/19/00017881	Cullys Corner Gypsum Mine	10/06/2021
Assessor Name	Report Created	BAM Data version *
Julie Gooding	09/11/2021	45
Assessor Number	BAM Case Status	Date Finalised
BAAS18074	Finalised	09/11/2021
Assessment Revision	Assessment Type	BOS entry trigger
3	Part 4 Developments (General)	BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	BC Act Listing status	EPBC Act listing status	Species sensitivity to gain class (for BRW)	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones											
1	170_Woodland	Not a TEC	55.3	55.3	5.2			High Sensitivity to Potential Gain	1.50		107
2	170_Shrubland	Not a TEC	7.1	7.1	4.2			High Sensitivity to Potential Gain	1.50		0
3	170_Disturbed	Not a TEC	0.8	0.8	1.5			High Sensitivity to Potential Gain	1.50		0

4	170_Shrubland_reveg	Not a TEC	4.2	4.2	0.29			High Sensitivity to Potential Gain	1.50		0
										Subtotal	**107**
Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion											
5	171_Woodland	Not a TEC	63.6	63.6	0.62			High Sensitivity to Potential Gain	1.50		15
										Subtotal	**15**
										Total	**122**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Species credits
Pterostylis cobarensis / Greenhood Orchid (Flora)								
170_Woodland	55.3	55.3	5.2	Vulnerable	Not Listed	2	False	143
171_Woodland	63.6	63.6	0.62	Vulnerable	Not Listed	2	False	20
							Subtotal	**163**

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00017880/BAAS18074/19/00017881

Proposal Name
Cullys Corner Gypsum Mine

BAM data last updated *
10/06/2021

Assessor Name
Julie Gooding

Assessor Number
BAAS18074

BAM Data version *
45

Proponent Names

Report Created
09/11/2021

BAM Case Status
Finalised

Assessment Revision
3

Assessment Type
Part 4 Developments (General)

Date Finalised
09/11/2021

BOS entry trigger
BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Not a TEC	11.2	107	0	107
171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Not a TEC	0.6	0	15	15

170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region

	Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Woodland	Yes	107	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Shrubland	No	0	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Disturbed	No	0	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Shrubland_reveg	No	0	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Dune Mallee Woodlands This includes PCT's: 171, 172, 191	Dune Mallee Woodlands <50%	171_Woodland	No	15	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Pterostylis cobarensis / Greenhood Orchid	**170_Woodland, 171_Woodland**	5.8	163.00

Credit Retirement Options

Like-for-like credit retirement options

	Spp	IBRA subregion
Pterostylis cobarensis / Greenhood Orchid	**Pterostylis cobarensis /** Greenhood Orchid	Any in NSW

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00017880/BAAS18074/19/00017881

Proposal Name
Cullys Corner Gypsum Mine

BAM data last updated *
10/06/2021

Assessor Name
Julie Gooding

Assessor Number
BAAS18074

BAM Data version *
45

Proponent Name(s)

Report Created
09/11/2021

BAM Case Status
Finalised

Assessment Revision
3

Assessment Type
Part 4 Developments (General)

Date Finalised
09/11/2021

BOS entry trigger
BOS Threshold: Area clearing threshold

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

BAM Biodiversity Credit Report (Variations)

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones	Not a TEC	11.2	107	0	107.00
171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	Not a TEC	0.6	0	15	15.00

170-Chenopod sandplain mallee woodland/shrubland of the arid and semi-arid (warm) zones

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Woodland	Yes	107	South Olary Plain,Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Shrubland	No	0	South Olary Plain,Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Disturbed	No	0	South Olary Plain,Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Sand Plain Mallee Woodlands This includes PCT's: 142, 170, 173, 174, 190, 193, 355, 474	Sand Plain Mallee Woodlands <50%	170_Shrubland_reveg	No	0	South Olary Plain,Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Semi-arid Woodlands (Shrubby sub-formation)	Tier 4 or higher threat status	170_Woodland	Yes (including artificial)	107	IBRA Region: Murray Darling Depression, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Semi-arid Woodlands (Shrubby sub-formation)	Tier 4 or higher threat status	170_Shrubland	No	0	IBRA Region: Murray Darling Depression, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Semi-arid Woodlands (Shrubby sub-formation)	Tier 4 or higher threat status	170_Disturbed	No	0	IBRA Region: Murray Darling Depression, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Semi-arid Woodlands (Shrubby sub-formation)	Tier 4 or higher threat status	170_Shrubland_reveg	No	0	IBRA Region: Murray Darling Depression, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

171-Spinifex linear dune mallee mainly of the Murray Darling Depression Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region

	Dune Mallee Woodlands This includes PCT's: 171, 172, 191	Dune Mallee Woodlands <50%	171_Woodland	No	15	South Olary Plain,Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Variation options					
	Formation	Trading group	Zone	HBT	Credits	IBRA region
	Semi-arid Woodlands (Shrubby sub-formation)	Tier 4 or higher threat status	171_Woodland	No	15	IBRA Region: Murray Darling Depression, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Pterostylis cobarensis / Greenhood Orchid	**170_Woodland, 171_Woodland**	5.8	163.00

Credit Retirement Options

Like-for-like options

Pterostylis cobarensis/ Greenhood Orchid	Spp		IBRA region
	Pterostylis cobarensis/Greenhood Orchid		Any in NSW
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Vulnerable	South Olary Plain, Barrier Range Outwash, Darling Depression, Great Darling Anabranch, Lachlan, Menindee, Murray Fans, Murray Scroll Belt, Murrumbidgee, Pooncarie-Darling and Robinvale Plains. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.