



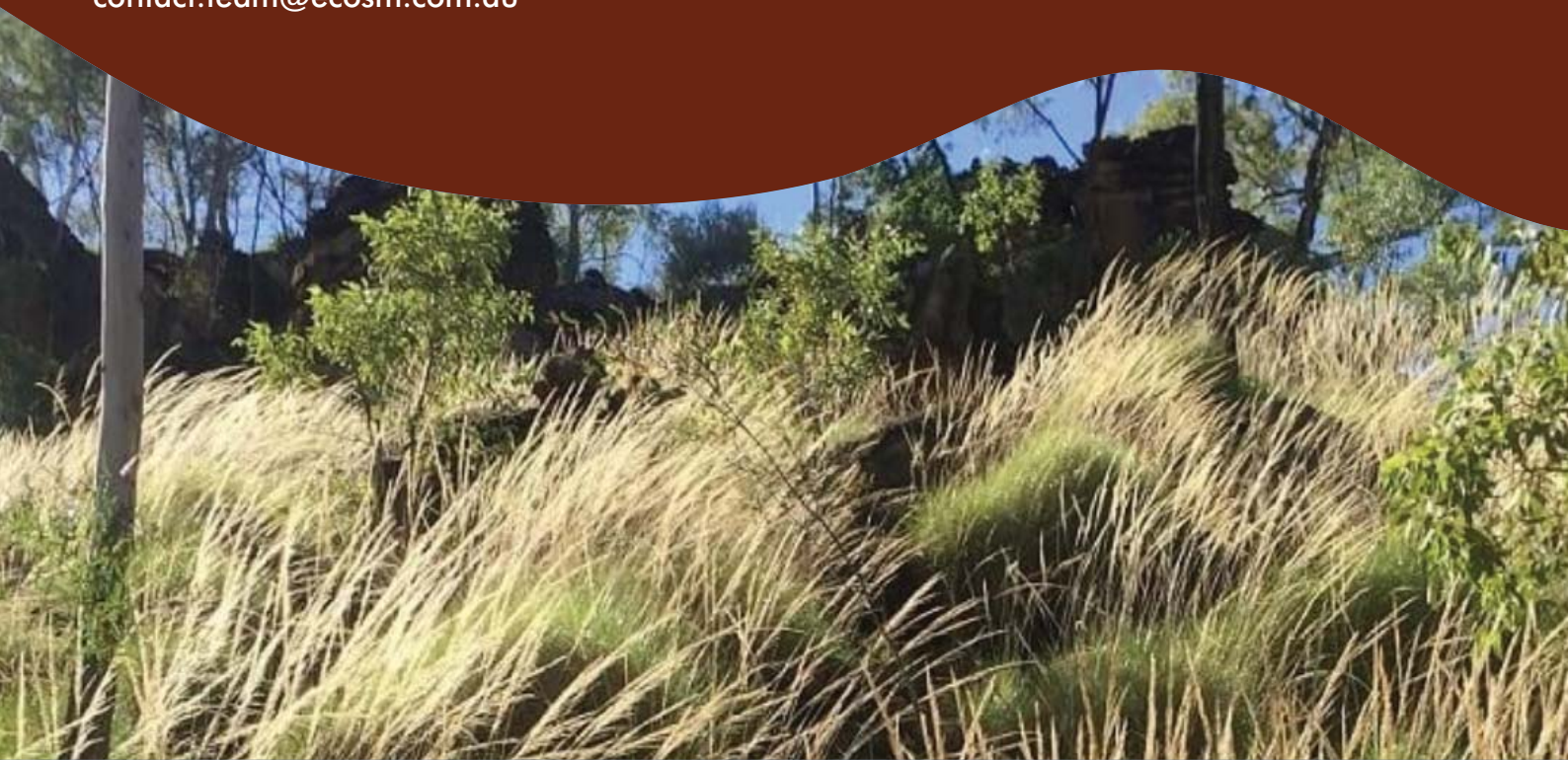
ECO SOLUTIONS & MANAGEMENT

BARALABA SOUTH PROJECT BIODIVERSITY OFFSETS STRATEGY

November 2023

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Document History and Status

Document version:	23015 Rpt02b
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Date issued:	23 November 2023
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Contents

1	Introduction	1
1.1	Project background	1
1.2	Purpose and scope	2
1.3	Terrestrial ecological values	2
1.4	Assumptions	5
2	Commonwealth Environmental Offsets Framework	6
3	Offset hierarchy	7
3.1	Summary of impacts	7
3.1.1	Direct impacts	7
3.1.2	Indirect impacts.....	7
3.2	Measures to avoid impacts	8
3.3	Measures to mitigate impacts	8
3.4	Significant residual impacts.....	8
3.5	Offset requirements	11
4	Offsets for Matters of National Environmental significance.....	12
4.1	Offset delivery options.....	12
4.2	Direct offsets.....	12
4.2.1	Protected attribute	12
4.2.2	Habitat quality.....	13
4.2.3	Impact calculator inputs	17
4.3	Indirect offsets	17
4.3.1	<i>Xerothamnella herbacea</i>	18
4.3.2	Ornamental Snake	18
5	Potential offset properties	20
5.1	Methodology	20
5.1.1	Database searches and Government mapping	20
5.1.2	Review of aerial photography	21
5.1.3	Field surveys.....	21
5.1.4	Habitat quality scoring.....	22
5.2	Results	22
6	Protected matter offsets	24
6.1	<i>Xerothamnella herbacea</i>	26
6.1.1	Offset assessment guide.....	26
6.1.2	Recommended management measures.....	27
6.1.3	EPBC Act offset policy principles	27

6.2	Ornamental Snake	29
6.2.1	Offset assessment guide	30
6.2.2	Recommended management measures.....	36
6.2.3	EPBC Act offset policy principles	36
7	Conclusions.....	39
8	References.....	40

List of Tables

Table 1:	Summary of impacts in the project disturbance footprint	10
Table 2:	Summary of habitat quality scoring attributes for Ornamental Snake 14	
Table 3:	Habitat quality scores for Ornamental Snake	15
Table 4:	Impact calculator inputs for impacted MNES.....	17
Table 5:	Comparison of protected matter values of each offset investigation area 23	
Table 6:	Offset calculator inputs for <i>Xerothamnella herbacea</i> (Property F)	26
Table 7:	Environment Offsets Policy Principles (<i>Xerothamnella herbacea</i>)	27
Table 8:	Offset calculator inputs for potential offset properties A, B and E	31
Table 9:	Environment Offsets Policy Principles (Ornamental Snake)	36

List of Figures

Figure 1:	Locality plan.....	43
Figure 2:	Project layout and disturbance footprint.....	44
Figure 3:	Threatened flora	45
Figure 4:	Ornamental Snake habitat and records	46
Figure 5:	Potential offset properties	47
Figure 6:	Ornamental Snake habitat and records in Property A.....	48
Figure 7:	Ornamental Snake habitat in Property B	49
Figure 8:	Ornamental Snake habitat in Property E	50
Figure 9:	<i>Xerothamnella herbacea</i> habitat in Property F.....	51

Appendices

Appendix A:	Methodology for scoring species habitat indices – Ornamental Snake
Appendix B:	Habitat quality scoring – impact site raw data
Appendix C:	<i>Xerothamnella herbacea</i> – Offset assessment guide
Appendix D:	Ornamental Snake – Offset assessment guide and habitat quality scoring raw data

Symbols and abbreviations

BOS	Biodiversity Offsets Strategy
CHPP	Coal handling preparation plant
DAWE	(Commonwealth) Department of Agriculture, Water and the Environment
DCCEEW	(Commonwealth) Department of Climate Change, Energy the Environment and Water
DES	(Queensland) Department of Environment and Science
EA	Environmental Authority
EIS	Environmental Impact Statement
EPBC Act	(Commonwealth) <i>Environment Protection and Biodiversity Conservation Act 1999</i>
ETL	Electricity transmission line
ha	Hectares
km	Kilometres
ML	Mining Lease
MLA	Mining Lease Application
MNES	Matters of national environmental significance
RE	Regional ecosystem
ROM	Run of mine
SEWPaC	(Commonwealth) Department of Sustainability, Environment, Water and Populations
SPRAT	Species Profile and Threats Database
TEC	Threatened ecological community
TEIAR	Terrestrial Ecology Impact Assessment Report
TSSC	Threatened Species Scientific Committee
VM Act	(Queensland) <i>Vegetation Management Act 1999</i>

Glossary

Term	Definition
Bioregion	A geographically distinct biological region, which is a reporting unit for assessing the status of native ecosystems and their level of protection. Australia is divided into 89 bioregions. Bioregions form part of the regional ecosystem classification code system. The project disturbance footprint is located in the Dawson River Downs sub-region of the Brigalow Belt South Bioregion.
Endangered	Prescribed to a threatened ecological community or species under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
EPBC Act conservation status	<p>The <i>Environment Protection and Biodiversity Conservation Act 1999</i> lists species and communities:</p> <p>Extinct in the wild:</p> <ul style="list-style-type: none"> ▪ It is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or ▪ It has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a timeframe appropriate to its life cycle and form. <p>Critically Endangered:</p> <ul style="list-style-type: none"> ▪ It is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria. <p>Endangered:</p> <ul style="list-style-type: none"> ▪ It is not critically endangered; and it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria. <p>Vulnerable:</p> <ul style="list-style-type: none"> ▪ It is not critically endangered or endangered; and ▪ It is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria. <p>Migratory:</p> <ul style="list-style-type: none"> ▪ Migratory species which are native to Australia and are included in the appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals Appendices I and II) ▪ Migratory species included in annexes established under the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA) ▪ Native, migratory species identified in a list established under, or an instrument made under, an international agreement approved by the Minister, such as the Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA).
MNES	<p>A matter protected under the EPBC Act, including:</p> <ul style="list-style-type: none"> ▪ World heritage properties

Term	Definition
	<ul style="list-style-type: none"> ▪ National heritage places ▪ Wetlands of international importance ▪ Listed threatened species and ecological communities ▪ Migratory species ▪ Commonwealth marine areas ▪ The Great Barrier Reef Marine Park ▪ Nuclear actions ▪ A water resource, in relation to coal seam gas development and large coal mining development.
Project disturbance footprint	Area of impact relevant to the BOS and encompassing the project site, the ETL study area, water release/extraction infrastructure and proposed road realignment as shown on Figure 2.
Region	The local area surrounding the project disturbance footprint, including the landscape within 25 km of the project disturbance footprint.
Regional ecosystem	A vegetation community within a bioregion that is consistently associated with a particular combination of geology, landform and soils.
Remnant vegetation	Defined under the Queensland <i>Vegetation Management Act 1999</i> as, woody vegetation that has not been cleared or vegetation that has been cleared but where the dominant canopy has >70% of the height and >50% of the cover relative to the undisturbed height and cover of that stratum and is dominated by species characteristic of the vegetation's undisturbed canopy.
Threatened ecological community	A community listed under the provisions of the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .
Vulnerable	Prescribed to a threatened ecological community or species under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i> .

1 Introduction

Eco Solutions & Management was commissioned by Baralaba South Pty Ltd (the proponent) to prepare a Biodiversity Offset Strategy (BOS) as part of the Environmental Impact Statement (EIS) being prepared for the Baralaba South Project (the Project). The EIS will be used in support of mining lease (ML) and environmental authority (EA) applications. The BOS will also be used to support a Referral for the project under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

1.1 Project background

The project is located approximately 115 km south-west of Rockhampton and 8 km south of Baralaba in central Queensland (Figure 1). The project would consist of:

- a greenfield open-cut coal mine to be developed within MLA 700057 (referred to as the project site), including:
 - open-cut mining operations using conventional truck and excavator methods.
 - a Coal Handling Preparation Plant (CHPP).
 - a mining infrastructure area, including workshops, administration buildings, fuel and chemical storage facilities, warehouse and hardstand areas.
 - ROM coal and product coal stockpile pads.
 - topsoil stockpiles, laydown areas and borrow areas.
 - haul roads and internal roads.
 - water management infrastructure.
 - Temporary flood protection levee around the north-western boundary of the mine footprint from Year 1 to 3 that will be incorporated into the rehabilitated landform.
 - backfilling of mine voids with waste rock behind the advancing open-cut mining operations and the placement of waste rock in out-of-pit emplacements adjacent to the pit extents.
 - dewatering of CHPP coal rejects and disposal on-site within mine voids behind the advancing open-cut mining operation.
 - recovery and recycling of processed wastewater through the CHPP.
 - other associated minor infrastructure, plant, equipment, and activities; and
 - exploration activities
- water release/extraction pipeline and water pump station (referred to as the water release/extraction infrastructure)
- realignment of approximately 4.5 km section of Moura Baralaba Road to the east of MLA 700057

- product coal road transport approximately 40 km via the existing Baralaba North Mine haul route on public Council-controlled roads to the existing train load-out facility located approximately 2 km east of Moura; and
- Product coal rail transport to the Port of Gladstone for export to predominantly international markets.

The project also includes development of a proposed electricity transmission line (ETL) of approximately 8 km in length and 20 m in width. The ETL will link the project with the Baralaba Substation, located approximately 6 km east of the Baralaba township (Figures 1 and 2). A study area has been identified for consideration as part of this assessment, in which two ETL alignment options have been assessed. The final ETL alignment will be determined at a later date considering outcomes of this assessment. For the purpose of determining a required offset for an impacted MNES, the ETL alignment that results in the greater impact for any particular matter has been used to calculate the quantum of impacts under the EPBC offsets calculator.

An EPBC Referral (2012/6547) was lodged for the project with the project being declared a Controlled Action on 18 October 2012. The controlling provisions for the Project, with regards to its potential impacts on MNES are:

- listed threatened species and communities (sections 18 and 18A)
- listed migratory species (sections 20 and 20A), and
- water resources (sections 24D and 24E).

The controlled action decision was based on proposed potential terrestrial disturbance to the entire MLA area. Subsequent to the controlled action decision in 2012, the proposed project disturbance footprint was significantly reduced in 2023 (Figure 2) and as such, areas of impact to a number of MNES identified have also been significantly reduced.

1.2 Purpose and scope

The scope of this BOS is to:

- present the matters of national environmental significance (MNES) where significant residual impacts have been identified at the time of the controlled action decision
- present habitat quality scores and rationale for the EPBC Act offset calculator for the impact site
- outline mechanisms for delivering offsets
- present habitat quality scores and rationale for the EPBC Act offset calculator for potential offset sites

1.3 Terrestrial ecological values

The Terrestrial Ecology Impact Assessment Report (TEIAR) prepared by Eco Solutions & Management (Eco Solutions & Management 2023) provides a detailed account of the terrestrial ecological values recorded during seasonal flora and fauna surveys. The study area for the ecology surveys encompassed approximately 5,268 ha including the project disturbance footprint (i.e. the project

site, the ETL study area, water release/extraction infrastructure and proposed road realignment), as well as an additional investigation area (3,054 ha). Only matters considered MNES at the time of the controlled action decision within the project disturbance footprint identified during the ecology surveys are of relevance to this BOS and are illustrated in Figures 3 and 4 and summarised below.

- The project disturbance footprint encompasses land that has been extensively cleared and is currently used for cattle grazing. As a result, the majority of the footprint supports non-remnant vegetation with scattered relic trees. However, there are also areas of regrowth vegetation in various stages of recovery following historic clearing. Most communities in the project site are generally in a degraded state owing to ongoing cattle grazing and weed infiltration throughout the ground layer. The project disturbance footprint is approximately 1,284.7 ha.
- Approximately 10.1 ha of remnant vegetation was identified within the project disturbance footprint, consisting of least concern regional ecosystems (REs).
- A patch of regrowth of endangered vegetation within the ETL disturbance footprint (representative of RE 11.4.9a) is also representative of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC (Brigalow TEC) listed as endangered under the EPBC Act¹ (Figure 3).
- Vegetation (REs 11.3.1 and 11.4.9) within the project disturbance footprint is also representative of the Brigalow (*Acacia harpophylla* dominant and co-dominant) TEC (Brigalow TEC) listed as endangered under the EPBC Act² (Figure 3).
- One threatened flora species, *Xerothamnella herbacea* (no common name), listed as endangered under the EPBC Act was recorded within the project disturbance footprint. This assessment identified that it is unlikely that any other significant flora species that are MNES occur within the project disturbance footprint.
- Fauna habitat across the project disturbance footprint ranged from poor (i.e. non-remnant areas) to moderate (i.e. remnant vegetation). Nonetheless, the project disturbance footprint supports habitat for the following threatened fauna species that were either recorded during the field surveys or are considered likely to occur:
 - Ornamental Snake (*Denisonia maculata*) – vulnerable: present
 - Squatter Pigeon (Southern) (*Geophaps scripta scripta*) – vulnerable: present

¹ It should be noted that four patches of Brigalow were recorded but, although representative of remnant vegetation, the patch sizes were too small to satisfy the mapping requirements as prescribed in Neldner et al. (2020) and as such are not shown on the field-validated vegetation mapping. However, these patches were large enough to satisfy the diagnostic criteria and condition thresholds of the Brigalow TEC and have been shown in Figure 3.

² It should be noted that four patches of Brigalow were recorded but, although representative of remnant vegetation, the patch sizes were too small to satisfy the mapping requirements as prescribed in Neldner et al. (2020) and as such are not shown on the field-validated vegetation mapping. However, these patches were large enough to satisfy the diagnostic criteria and condition thresholds of the Brigalow TEC and have been shown in Figure 3.

- Koala (*Phascolarctos cinereus*) – vulnerable: moderate likelihood of occurrence in the project disturbance footprint
- Australian Painted Snipe (*Rostratula australis*) – endangered: moderate likelihood of occurrence in the project disturbance footprint.
- Two birds listed as migratory under the EPBC Act are considered to have a moderate likelihood to occur within the project disturbance footprint, namely Glossy Ibis (*Plegadis falcinellus*) and Latham’s Snipe (*Gallinago hardwickii*).

1.4 Assumptions

Key assumptions that form the basis of this BOS include the following:

- Only MNES for which significant residual impacts have been determined as part of the TEIAR (Eco Solutions & Management 2023) are considered as part of this BOS.
- Impacts relating to a proposed electricity transmission line (ETL) take into consideration two potential alignments of the ETL. Residual impacts to any MNES associated with the ETL have been determined using the greater impact that could result from the two alignments.
- The extent of offset requirements may change as a result of the assessment of the EIS by the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW).
- Habitat quality scoring methodologies used in this BOS are based primarily on the Queensland Government's approved methodology, with modifications and alternatives proposed as required to address the Commonwealth Government's offset policy requirements. The habitat quality scoring system may therefore change in response to DCCEEW's assessment.
- Environmental offset requirements are based on current offset policies and supporting guidelines in effect as of 18 October 2023.
- Only matters that were considered MNES at the time of the controlled action decision (i.e. 2012) have been assessed for significant impacts. However, all impacts have been determined from assessments undertaken as part of the TEIAR Management (Eco Solutions & Management 2023) and are based on current conservation advice.

2 Commonwealth Environmental Offsets Framework

Under the EPBC Act Environmental Offsets Policy 2012 (EPBC Act Environmental Offsets Policy) (SEWPaC 2012a), environmental offsets are actions taken to counterbalance significant residual impacts on MNES. Offsets are used as a last resort in instances where an action will give rise to significant residual impacts, even after the application of management measures.

The EPBC Act Environmental Offsets Policy specifies that an offset package must be built around direct offsets (i.e. land-based), which should form a minimum of 90% of the total offset requirement. Other compensatory measures (i.e. indirect offsets) can provide up to a maximum of 10% of the total offset requirement. Offsets should align with conservation priorities for the impacted protected matter and be tailored specifically to the attribute of the protected matter that is impacted in order to deliver a conservation gain.

Direct Offsets are those that result in a measurable conservation gain by:

- improving the condition and function of existing habitat for the protected matter
- creating new habitat for the protected matter
- reducing threats to the protected matter
- increasing the values of a heritage place
- averting the loss of a protected matter or its habitat that is under threat (the risk of loss is avoided as a result of securing an offset for conservation purposes or undertaking management to remove or reduce threats)
- being located strategically to enhance connectivity to existing areas of threatened ecological communities or species habitat.

Other compensatory measures (indirect offsets) may supplement a direct offset by:

- implementing priority actions outlined in relevant recovery plans
- targeted research such as assessing the effectiveness of revegetation techniques for a threatened ecological community
- educational programs that may be identified in recovery plans or other approved management plans for the relevant MNES and be targeted toward behavioural change and improvement in the viability of the protected matter.

The 'Offsets assessment guide' (Offsets Assessment Guide) which accompanies the EPBC Act Environmental Offsets Policy, has been developed to assist with determining the size and scope of an offsets package. The Offsets Assessment Guide is essentially a balance sheet approach to estimate impacts and offsets for threatened species and ecological communities (SEWPaC 2012b).

3 Offset hierarchy

In order to determine if an environmental offset is necessary, the impacts of a project need to be fully understood. The Commonwealth Government takes into consideration the offset hierarchy, which is to preferentially avoid impacts, mitigate impacts that are unavoidable and provide offsets for significant residual impacts. This section summarises the findings of the TEIAR (Eco Solutions & Management 2023) with regard to MNES relevant to the project and the offset hierarchy.

The following sections provide a summary of the direct and indirect impacts associated with the project, as well as measures to avoid and mitigate impacts. An assessment of the resulting significant residual impacts and associated offset requirements is also presented.

3.1 Summary of impacts

3.1.1 Direct impacts

Direct impacts associated with project involve vegetation clearing, soil removal and storage, earthworks and drainage works. The project will result in the removal of threatened ecological communities, threatened flora species and habitat for threatened fauna species in the form of:

- 1.4 ha of regrowth vegetation identified as supporting the Brigalow TEC
- approximately 90 individuals of *Xerothamnella herbacea*
- 21.9 ha of habitat for the Squatter Pigeon
- 34.9 ha of habitat for the Ornamental Snake
- 34.9 ha of potential habitat for the Australian Painted Snipe, including 33.9 ha of marginal habitat
- 26.5 ha of habitat for the Koala (assessed as not constituting habitat critical to survival of this species)
- 97.6 ha of temporary habitat for Latham's Snipe
- undetermined area of temporary habitat for Glossy Ibis.

Habitat for the Greater Glider (southern and central) (*Petauroides volans*), Yellow-bellied Glider (south-eastern) (*Petaurus australis australis*) and White-throated Needletail (*Hirundapus caudacutus*) was identified within the project disturbance footprint (Eco Solutions & Management 2023). However, at the time of the controlled action decision, these species were listed as least concern or migratory under the EPBC Act and as such, offsets for potential impact to these species were not required. It should be noted that significance assessments were undertaken for these species as part of the TEIAR report and the impacts were not considered to be significant (Eco Solutions & Management 2023).

3.1.2 Indirect impacts

Indirect impacts, associated with the project that have the potential to impact vegetation communities and fauna habitat include the introduction or spread of

invasive species, habitat fragmentation, changes to floodplain ecology, erosion and sedimentation, vehicle strike, light, noise and dust.

3.2 Measures to avoid impacts

The following measures have been implemented during the mine design phase to avoid impacts to potential MNES:

- Locating mining operations in eastern portion of the ML and avoiding impacts to large areas of Ornamental Snake habitat.
- avoidance of remnant Coolibah woodland which was identified as representing the Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions has been enabled through mine-design.
- positioning of the water release/extraction infrastructure in areas of non-remnant vegetation and installing the intact/discharge pipes above ground through the narrowest section of riparian woodland fringing the Dawson River, thereby eliminating the need to clear any wood vegetation.
- realigning the Moura-Baralaba Road to avoid impacts to any remnant or high value regrowth vegetation that may be or provide habitat for MNES.

3.3 Measures to mitigate impacts

As part of the process of assessment of environmental impacts and detailed mine design, additional measures will be developed to avoid, minimise and mitigate impacts. This will include site environmental management measures such as:

- weed and pest animal management
- erosion and sediment control
- topsoil management plan
- rehabilitation management and monitoring plan
- permits to disturb, authorising the boundaries of all disturbance activities and inclusive of requirements for a spotter catcher, species management, clearing methods, erosion control and topsoil management
- clearing of potential habitat for conservation significant species will include engagement of a spotter-catcher
- Species Management Programs
- dust suppression
- blast management
- water management plan, including site water balance
- surface water and groundwater monitoring plans
- receiving environment monitoring program.

3.4 Significant residual impacts

The TEIAR (Eco Solutions & Management 2023) prepared for the project includes an assessment of the significance or residual impacts to MNES recorded or

assessed as having the potential to occur in the project disturbance footprint. Table 1 summarises the results of the significant residual impacts assessments.

Table 1: Summary of impacts in the project disturbance footprint

Protected matter	EPBC Act Status	Likelihood of occurrence	Total area (ha)/ no. of individuals present	Total maximum area (ha)/ individuals to be cleared	Potential for significant impact? ¹
TECs					
Brigalow TEC	Endangered	Present	14.0 ha	1.4 ha	No
Threatened flora					
<i>Xerothamnella herbacea</i>	Endangered	Present	~90 individuals	~90 individuals	Yes
Threatened fauna					
Squatter Pigeon habitat	Vulnerable	Present	84.7 ha	21.9 ha	No
Ornamental Snake habitat	Vulnerable	Present	65.0 ha (+34.6 ha marginal)	34.9 ha	Yes
Australian Painted Snipe habitat	Endangered	Moderate	31.1 ha (+68.5 ha marginal habitat)	1 ha (+33.9 ha marginal habitat)	No
Koala habitat	Vulnerable ²	Moderate	111.1 ha	26.5 ha	No, habitat not critical to survival
Migratory bird species					
Glossy Ibis habitat	Migratory	Moderate	As per Australian Painted Snipe		No
Latham's Snipe habitat	Migratory	Moderate	As per Australian Painted Snipe		No

¹Based on assessment of impacts in accordance with the EPBC Act Significant Impact Guideline (DEWHA 2009).

²The Koala was listed as vulnerable at the time of the controlled action decision.

3.5 Offset requirements

Biodiversity offsets are required to compensate for significant residual impacts on MNES. With reference to the significant residual impact assessments completed as part of the TEIAR (Eco Solutions & Management 2023) and summarised in Table 1, the project will have a significant impact on the following MNES:

- *Xerothamnella herbacea*: approximately 90 individuals of this species will be cleared.
- Ornamental Snake: 34.9 ha of habitat for this species will be cleared.

The proponent will therefore be required to deliver offsets under the EPBC Act Environmental Offsets Policy for these two MNES.

4 Offsets for Matters of National Environmental Significance

4.1 Offset delivery options

The project will result in the removal of habitat for the Ornamental Snake and *X. herbacea*. Therefore, the provision of land-based (i.e. direct) offsets built around creating, improving, protecting and/or managing similar habitat for these protected matters is considered an appropriate approach for compensating for the project impacts.

In determining the appropriateness of a proposed offset package, the DCCEEW will consider:

- what types of activities would be appropriate as offsets for a given impact
- determining the specific size and scope of an offsets package.

Direct offsets under the EPBC Act need to be 'like for like' and demonstrate how the MNES impacted has directly benefited as a result of the offset.

4.2 Direct offsets

This section of the BOS addresses the first component of the Offsets Assessment Guide that relates to quantifying the nature and extent of the impacts likely to occur at the proposed impact site. Specifically, for each MNES being impacted, the Offsets Assessment Guide takes into account the following attributes of the impact site (SEWPaC 2012b):

- **protected attribute:** being impacted (e.g. area of habitat, nesting features, number of individuals, birth/mortality rates)
- **habitat quality:** how important to the ecology of the protected matter is the attribute that is being impacted
- **size of the impact:** how much of the attribute is being impacted.

As noted previously, the project will result in the removal of approximately 90 individuals of *X. herbacea* and 34.9 ha of Ornamental Snake habitat. The following sections address the protected attribute and habitat quality components of the Offsets Assessment Guide.

4.2.1 Protected attribute

The following protected attributes are relevant to assessment of offsets for MNES significantly impacted by with the project.

- *Xerothermella herbacea*: number of individuals
[Direct counts of individuals of this species are practically achievable]
- Ornamental Snake: area of habitat
[Habitat being impacted is likely to be used for breeding and foraging, quantification of specific breeding features or numbers of individuals cannot practically be achieved]

4.2.2 *Habitat quality*

The Offsets Assessment Guide (SEWPaC 2012b) specifies that assessment of the quality of habitat being impacted must be calculated for the 'area of species habitat' (Ornamental Snake) protected attributes. Habitat quality scoring does not form part of the impact calculator for the 'number of individuals' protected attribute being applied for *X. herbacea*.

Habitat quality scoring must take into account the following components:

- **Site condition:** This is the condition of a site in relation to the ecological requirements of a threatened species or ecological community. This includes considerations such as vegetation condition and structure, the diversity of habitat species present, and the number of relevant habitat features.
- **Site context:** This is the relative importance of a site in terms of its position in the landscape, taking into account the connectivity needs/benefits of a threatened species or ecological community. In relation to a species, this includes considerations such as movement patterns, the proximity of the site in relation to other areas of suitable habitat, and the role of the site in relation to the overall population or extent of a species. In relation to a community, this includes the size of the patch, the degree of separation from other patches of remnant vegetation as well as the amount of remnant vegetation within the immediate region of the site.

Species stocking rate: This is the usage and/or density of a species at a particular site. This principle acknowledges that a particular site may have a high value for a particular threatened species, despite appearing to have poor condition and/or context. It includes considerations such as survey data for a site in regard to a particular species population or, in the case of a threatened ecological community this may be a number of different populations. It also includes consideration of the role of the site population in regard to the overall species population viability or community extent.

For the purposes of this BOS, habitat quality scores for the impact site were calculated using data collected in accordance with the Queensland Government's '*Guide to Determining Terrestrial Habitat Quality, version 1.3*' (DES 2020)(the Habitat Quality Guide). This approach broadly aligns with the EPBC Act Environmental Offsets Policy measure of 'habitat quality' in that site condition, site context and species habitat are assessed using a combination of field data, GIS spatial analysis and information on species ecology. Table 2 below details how the attributes between the Commonwealth and State habitat quality scoring systems were aligned to calculate habitat quality scores for Ornamental Snake habitat.

The Habitat Quality Guide suggests that sites are stratified into assessment units which are a defined area or group of areas of at least 1 ha in total size within the matter area that is relatively homogenous in that it contains only one regional ecosystem.

The area of several assessment units within the project disturbance footprint does not meet the minimum area thresholds of 1 ha. For these assessment units, the species habitat quality scores have been derived using the averages of the entire assessment unit which includes polygons that are within the MLA but outside of

the disturbance footprint. This is relevant to assessment units 1, 4 and 5. Locations of polygons that contribute to each assessment unit are provided in Figure 4.

Table 2: Summary of habitat quality scoring attributes for Ornamental Snake

EPBC Act habitat quality attribute	Queensland Habitat Quality Guide
Site condition	<p>13 attributes measured in the field across a 50 x 100 m habitat quality plot (HQP):</p> <ul style="list-style-type: none"> ▪ recruitment of woody perennial species in EDL ▪ native plant species richness - trees ▪ native plant species richness - shrubs ▪ native plant species richness - grasses ▪ native plant species richness - forbs ▪ tree canopy height ▪ tree canopy cover ▪ shrub canopy cover ▪ native perennial grass cover ▪ organic litter ▪ large trees ▪ coarse woody debris ▪ non-native plant cover
Site context	<p>Three attributes assessed using GIS spatial analysis:</p> <ul style="list-style-type: none"> ▪ size of patch ▪ connectedness ▪ context
Species stocking rate	<p>In accordance with the Habitat Quality Guide, habitat for Ornamental Snake was assessed in terms of quality and availability of:</p> <ul style="list-style-type: none"> ▪ food and habitat required for foraging ▪ habitat required for shelter and breeding ▪ habitat required for mobility ▪ threat to species. <p>Ecological Survey & Management has developed a scoring system for these attributes that is based on the SPRAT profile, published research and field-based knowledge for the Ornamental Snake. The methodology for scoring these attributes is provided in Appendix A.</p>

To achieve an overall habitat quality score (out of 10) for impacted species that are MNES, site condition, site context and species stocking rate are multiplied by a weighting factor, which is typically accepted by DCCEEW to be 30% for site condition, 30% for site context and 40% for species stocking rate.

Table 3 provides the habitat quality scores allocated and the supporting rationale for significant impacts to Ornamental Snake. Appendix B provides the raw data used to achieve the habitat quality scores.

Table 3: Habitat quality scores for Ornamental Snake

Habitat quality component	Score	Rationale
Site condition	1/3 (rounded down from 1.3)	<p>Raw score = 4.3 multiplied by 30% weighting (Appendix B).</p> <p>Ornamental Snake habitat within the project disturbance footprint has been classified into the following categories:</p> <ul style="list-style-type: none"> ▪ drainage lines with fringing vegetation and some fallen timber ▪ gilgai and wetland habitat (with or without vegetation or fallen timber) ▪ marginal gilgai habitat (without vegetation or fallen timber). <p>These habitats were found to vary in condition based on the history of disturbance (i.e. vegetation clearing, blade ploughing, cattle grazing, weed invasion), presence, depth and condition of gilgai, and abundance of fallen timber.</p> <p>It is noted that Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles, recognises gilgai and fallen timber present as being key habitat for this species (SEWPaC 2011).</p>
Site context	1/3 (rounded down from 0.8)	<p>Raw score = 2.8 multiplied by 30% weighting (Appendix B).</p> <p>Connectivity between gilgai habitat is important for the Ornamental Snake (SEWPaC 2011). Habitat for this species within the project disturbance footprint consists of isolated patches within a predominantly cleared landscape (Figure 4). In order to move between patches, Ornamental Snake would need to traverse cleared paddocks exposed to cattle activity and infiltration by Buffel Grass, both of which are recognised as threats to the Ornamental Snake (DCCEE 2023).</p>
Stocking rate	3/4 (rounded up from 2.6)	<p>Raw score = 6.5 multiplied by 40% weighting (Appendix B).</p> <p>Two individuals of this species were recorded in non-remnant Coolibah (RE 11.3.3.) that graded into a small patch of non-remnant Brigalow woodland (RE 11.3.1) associated with a stream order 1 drainage line in the south-western portion of the project disturbance footprint during the terrestrial ecology surveys (Eco Solutions & Management 2023). Habitat associated with the drainage line where the Ornamental Snakes were recorded does not clearly align with the Draft Referral Guidelines for the nationally listed Brigalow Belt reptiles, whereby there was no gilgai and very little fallen timber present (SEWPaC 2011). Nonetheless, the species is present and using habitat both within the project disturbance footprint and in adjacent communities. Therefore, in line with the Draft Referral Guidelines for</p>

Habitat quality component	Score	Rationale
		the nationally listed Brigalow Belt reptiles, (SEWPaC 2011) habitat within the project disturbance footprint is therefore considered to be important habitat for this species.
Total score	5/10	<p>Areas of gilgai, wetland and riparian communities within the project disturbance footprint have been determined to be important habitat for the Ornamental Snake, given that two individuals were recorded during the seasonal fauna surveys (Eco Solutions & Management 2023).</p> <p>However, the majority of habitat present is in a moderately to highly degraded state owing to historic and ongoing land management practise (i.e. vegetation clearing, cattle grazing, blade ploughing and weed invasion). All areas of habitat are isolated, with the only opportunities for individuals to move between patches being through cleared paddocks that are currently grazed and subject to weed invasion.</p>

4.2.3 Impact calculator inputs

The impact calculator component of the Offset assessment guide has been completed for MNES being significantly impacted and the results are provided in Table 4 below.

Table 4: Impact calculator inputs for impacted MNES

Protected attribute description	Quantum of impact	
<i>Xerothamnella herbacea</i>		
This species was recorded in 10 locations within a fragmented and considerably degraded patch of regrowth vegetation in the central eastern portion of the project disturbance footprint. The number of individuals present at each location was low and ranged from one individual to around 20 individuals.	Quantum of impact (number of individuals)	90
<i>Ornamental Snake</i>		
The project disturbance footprint Ornamental Snake habitat in the form of: <ul style="list-style-type: none"> ▪ drainage lines with fringing vegetation and some fallen timber ▪ gilgai and wetland habitat (with or without vegetation or fallen timber) ▪ marginal gilgai habitat (without vegetation or fallen timber). These habitats were found to vary in condition based on the history of disturbance (i.e. vegetation clearing, blade ploughing, cattle grazing, weed invasion), presence, depth and condition of gilgai, and abundance of fallen timber.	Area (ha)	34.9
	Quality (scale 0-10)	4
	Total quantum of impact (adjusted ha)	17.45

4.3 Indirect offsets

The potential exists for 10% of a proposed offset package to be achieved through the provision of other compensatory measures (i.e. research into the species ecology, priority actions identified in a recovery plan and/or educational programs). In accordance with the EPBC Act Environmental Offsets Policy, research and education programs must:

- endeavour to improve the viability of the impacted protected matter
- be targeted toward key research/education activities as identified in the relevant Commonwealth approved recovery plan, threat abatement plan, conservation advice, ecological character description, management plan or listing document
- be undertaken in a transparent, scientifically robust and timely manner
- be undertaken by a suitably qualified individual or organisation in a manner approved by the department
- consider best practice research approaches.

4.3.1 *Xerothermella herbacea*

There is currently no recovery plan in place for this species. The DCCEEW SPRAT Profile identifies that a Recovery Plan is not required. The following priority recovery and threat abatement actions identified in the approved conservation advice (TSSC 2008) for this species that have the potential to contribute to indirect offsets for this TEC (if required) include:

- Undertake survey work in suitable habitat and potential habitat to locate any additional populations/occurrences/remnants.
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Manage known sites to prevent introduction of invasive weeds, which could become a threat to *X. herbacea*, using appropriate methods.
- Identify appropriate intensity and interval of fire to protect *X. herbacea* in its habitat.
- Undertake appropriate seed collection and storage.
- Investigate options for linking, enhancing or establishing additional populations.

4.3.2 *Ornamental Snake*

There is currently no recovery plan in place for this species. The DCCEEW SPRAT Profile identifies that a Recovery Plan is not required, as the approved Conservation Advice provides sufficient direction for recovery of the species. In addition, 'The recovery plan for the Queensland Brigalow Belt Reptiles' (Richardson 2006), which includes the Ornamental Snake, also provides recovery actions for this species. Recovery actions that have the potential to contribute to indirect offsets for this species (if required) include:

- identifying research priorities: develop and support the implementation of research projects undertaken by tertiary and research institutions
- inspecting and identifying suitable habitat for conservation of the Ornamental Snake
- identifying key threats and develop management guidelines to protect key habitat
- developing and providing land-management guidelines and incentives for landowners to reduce the impact of current land use practices on the species outside reserves, e.g. restricting the use and spread of agricultural weeds, such as Buffel Grass
- facilitating on-ground projects to manage and protect habitats on a range of land tenures in line with recommended management guidelines, e.g. in integrated weed and feral predator management programs
- developing community awareness within the species' known range through media campaigns and education material and provide incentives for wider community involvement, e.g. local governments and schools participating in reptile educational programs and adopting a local reptile species as their shire and/or school icon

- working with landholders and key stakeholders to undertake monitoring programs on selected sites.

The approved conservation advice (TSSC 2014) for this species recognises the following research priorities:

- more precisely assessing population size, distribution, ecological requirements and the relative impacts of threatening processes
- designing and implementing a monitoring program in key habitat and priority conservation areas
- monitoring known populations to identify key threats
- monitoring the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

5 Potential offset properties

The proponent has identified a number of potential offset properties as part of the approvals process for the project which have been considered in the preparation of this document and demonstrate the proponent can meet the offset obligation by achieving conservation of like-for-like values in nearby locations. As far as practicable, it has been the proponent's intention to co-locate offsets for each matter significantly impacted by the project within the same offset property. However, the ecology of the two matters has made it difficult to find a property that contains the vegetation community or specific habitat for all two matters.

The properties are described as follows:

- Property A -encompassing 245.6 ha and located north of the project in close proximity to the Dawson River.
- Property B - encompassing 338.7 ha and located north of the project in close proximity to the Dawson River.
- Property C - encompassing 381.9 ha in close proximity to the project.
- Property D - encompassing 586.5 ha in close proximity to the project.
- Property E - encompassing 253.3 ha and located north-west of the project.
- Property F - encompassing 448.3 ha and located south of the project.

All of the potential offset properties are located in the Dawson River Downs sub-region of the Brigalow Belt South bioregion, which is the same sub-region in which the project is located. All potential offset properties are located within 32 km of the project in the vicinity of the townships of Baralaba or Moura (Figure 5).

The composition of properties that will be utilised to meet the offset obligation is not yet known, and alternative locations may also become available as further investigations proceed.

In each case, whichever property or properties ultimately comprise the offset for the Project, the proponent is committed to implementing management measures which aim to reduce threats and improve ecological condition of the relevant MNES. The management measures, performance objectives and timeframes will be detailed in an Offset Management Plan (OMP). The OMP would be prepared and approved by DCCEEW prior to the commencement of the action.

5.1 Methodology

The terrestrial ecology values and presence/absence of relevant MNES within each potential offset property was assessed using a combination of desktop investigations and field surveys.

5.1.1 Database searches and Government mapping

Database searches were undertaken for the offset areas to identify government mapping (e.g. vegetation communities, wetlands etc.) and records or potential occurrences of threatened, near threatened, migratory and/or special least concern flora and fauna species. Database searches were undertaken using a polygon that encompassed all five offset properties and achieved a minimum

25 km radius from the boundary of each offset property (the search area). The search area is considered to be representative of the broader region.

Desktop searches covered the following databases and government mapping sources:

- Queensland Wildlife Online database, accessed 15 May 2020 (DES 2019)
- The Atlas of Living Australia³, accessed 15 May 2020 (CSIRO 2019)
- Regulated Vegetation Management Map, Vegetation Management Supporting Map Version 10.1 (maps at 1:100 000 scale) (DNRME 2018a)
- Essential Habitat Mapping and Database Version 7.07, mapped by the Department of Environment and Science (DES) and is vegetation in which a flora or fauna species that is endangered, vulnerable or near threatened has been known to occur (DNRME 2018b)
- Geological Survey of Queensland 1:100 000 mapping (NRM 2011).

The Biodiversity Assessment and Mapping Methodology (BAMM) has been prepared to provide a consistent approach for assessing biodiversity values at the landscape scale in Queensland using vegetation mapping data generated or approved by the Queensland Herbarium as a fundamental basis. It is being used by DES to generate Biodiversity Planning Assessments (BPAs) for each of Queensland's bioregions.

5.1.2 Review of aerial photography

Digital Globe aerial photography was viewed in relation to relevant biodiversity spatial layers. Aerial photography was used to identify features for ground-truthing during the field surveys, to identify appropriate survey locations and for determining potential terrestrial flora and fauna habitats.

5.1.3 Field surveys

The field validation of vegetation and fauna habitat in the potential offset properties was undertaken over two survey periods as follows:

- preliminary scoping surveys: 4 days, or part thereof (8, 14, 15 & 16 May 2020, inclusive)
- plot-based assessments: 9 days, or part thereof (25 & 26 September, 14 to 18 October 2020, and 8 & 9 February 2021 inclusive)
- targeted searches for Ornamental Snake (i.e. nocturnal spotlighting): 6 evenings (26 September, 14 to 18 October 2020, and 8 February 2021 inclusive)

The field surveys were carried out in accordance with the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland, Versions 5.1*, current at the time of the field surveys (Neldner et al. 2020).

³ The Atlas of Living Australia is a publicly available database that is populated by a wide range of contributors including 'citizen-based' contributors. The database does not allow for every individual observation to be validated; therefore, this database has been used as secondary supporting information.

Vegetation assessments were performed throughout the potential offset properties to thoroughly assess Queensland Government mapped vegetation. In addition to the vegetation assessment sites that were used to validate vegetation communities in the potential offset properties, additional site condition data was collected at a series of Habitat Quality Plots (HQP), in accordance with the methodology described in the Habitat Quality Guide (refer Section 4.2.2). These HQP plots were undertaken in order to determine habitat quality scores for Ornamental Snake habitat (refer Section 4.2.2).

5.1.4 Habitat quality scoring

Habitat quality scores were generated for any areas of potential Ornamental Snake habitat recorded within the potential offset properties. The approach used to generate habitat quality scores for the impact site were used for the potential offset properties (refer Section 4.2.2).

5.2 Results

All of the offset investigation areas are located in the Dawson River drainage sub-basin of the Fitzroy Basin. All of the properties are in close proximity to either the Dawson River or a tributary of the Dawson River (i.e. Dawson River anabranch, Banana or Kianga creeks). They share generally similar elevation, topography, vegetation and habitats to that of the project disturbance footprint. Land use and disturbance histories of the offset investigation areas are also similar with the project disturbance footprint, being substantially cleared and actively grazed by cattle, which has resulted in large, cleared areas, fragmentation of remnant vegetation and residual small pockets of regrowth vegetation.

Only the Property F offset investigation area was found to support both *X. herbacea* and habitat for the Ornamental Snake. However, habitat for Ornamental snake present within the Property F offset was considered marginal due to a lack of some key habitat features such as prevalent surface cracking, and consequently was considered likely to only represent dispersal habitat for Ornamental Snake. However, this property was found to support habitat for both matters and further assessment of suitability may be worthwhile. For the purposes of the current assessment, given that more suitable (breeding and/or foraging) habitat for Ornamental snake was identified on other offset investigation areas, Property F is not considered a suitable offset for Ornamental snake and is only considered a suitable offset for *Xerothermella herbacea*.

Table 5 summarises the relevant MNES that were identified at each investigation area. Details of the quality of the MNES recorded within each property are provided in Sections 6.1 to 6.3.

Table 5: Comparison of protected matter values of each offset investigation area

Significantly impacted matter	Offset investigation area					
	Property A	Property B	Property C	Property D	Property E	Property F
<i>Xerothamnella herbacea</i>	Not present	Not present	Not present	Not present	Not present	Present
Ornamental Snake habitat	Present	Not present	Not present	Not present	Present	Not present

6 Protected matter offsets

This section of the BOS addresses the offset site components of the Offsets Assessment Guide that relates to establishing the:

- improvement the offset will deliver of the attribute being significantly impacted
- level of 'averted loss' resulting from the proposed offset.

Specifically, the Offsets Assessment Guide takes into account the following components for the offset site (SEWPaC 2012b). Note that not all components apply to every protected attribute (i.e. 'area of community', 'area of habitat' and 'number of individuals').

1. **Habitat quality.** Three scores are considered for the offset site:

- **start quality** - the quality of the offset site at the time of assessment
- **future quality without offset** - estimated at the time at which the ecological benefit of the offset is expected to be realised (this time is input at time until 'ecological benefit' see (3) below) incorporating the proposed offset activities.
- **future quality with offset** - is the estimate of the habitat quality at this future time based on a 'business-as-usual' scenario – that is, considering current management practices, use of the site and historic trends for the quality of habitat on the site.

Note that for the 'number of individuals' protected attribute, start value, future value without offset and future value with offset replace the above habitat quality scores.

2. **Time over which loss is averted.** This is the foreseeable timeframe (in years) over which changes in the level of risk to a proposed offset site can be considered and quantified. That is, it is the time that any measures for securing a site for conservation purposes, such as conservation covenants on title, are intended to last.
3. **Time until ecological benefit.** This component is the estimated time (in years) that it will take for the habitat quality improvement of the proposed offset to be realised. This component is connected to the 'future quality with offset', and 'future quality without offset', as it defines the future point in time for which these quality scores are predicted.
4. **Risk of loss (%).** This percentage figure describes the chance that the habitat on the proposed offset site will be completely lost (i.e. no longer hold any value for the protected matter) over the foreseeable future (either the life of the offset or 20 years, whichever is shorter). An estimated risk of loss is entered in the guide for both the business as usual (i.e. without offset) and with offset scenarios. The difference between these figures is the level of averted loss provided by the proposed offset.
5. **Confidence in result (%).** This percentage figure describes the level of certainty about the success of the proposed offset. Proposed offset actions that are designed to have a lower risk of failure should have a higher confidence in result score. For the 'area of community' and 'area of habitat'

attributes, there are two components to which confidence in result relates: 'change in habitat quality' and 'averted loss'.

The following sections present an analysis of the capacity of the potential offset properties to satisfy the offset requirements for relevant significantly impacted MNES.

6.1 *Xerothamnella herbacea*

6.1.1 Offset assessment guide

The offset calculator component of the Offset assessment guide has been completed for the population of *X. herbacea* recorded in Property F and a summary of the results are provided in Table 8 below.

Table 6: Offset calculator inputs for *Xerothamnella herbacea* (Property F)

Variable	Value used and rationale
Start value	Value used: 2,000 It was estimated during field surveys that at least 2,000 individuals of <i>X. herbacea</i> are present within Property F (Figure 9).
Future value without offset	Value used: 90% The property is currently used for cattle grazing and the habitat present is at risk of decline resulting from: <ul style="list-style-type: none"> ▪ trampling by cattle ▪ maintenance of Brigalow regrowth vegetation ▪ weed invasion and expansion PMAV overlaying the property and coding the proposed habitat as Category X, i.e. legally able to be cleared.
Future value with offset	Value used: 5% Legally securing the area as an environmental offset will provide protection from degrading processes such as clearing and sustained cattle grazing. Active management of the area as offset will improve the quality of the habitat present through weed management and increased floristic diversity.
Time horizon	Value used: 20 years It is intended for the legally securing mechanism across the offset would be valid for a minimum of 20 years. It is proposed that this period of time would be sufficient for the existing populations in the absence of yearly grazing pressure and trampling to expand in number and potential spread and establish in other locations within the subject property.
Confidence in result	Value used: 95% Active and adaptive management of offsite sites is known to improve the ecological condition and improve the capacity of the offset to achieve conservation gains. The offset is considered to have a moderate to high degree of resilience given there are sufficient numbers of <i>X. herbacea</i> present to regenerate and colonise the offset once degrading processes have been removed

The application of these values in the EPBC Act offset calculator yields an offset requirement percentage of 2,079%.

The proponent has identified several additional properties that support known, Herbarium-confirmed records of *X. herbacea* within the region which could also meet the offset obligation and is in discussions with key stakeholders about potential offsets.

6.1.2 Recommended management measures

Existing threats to the condition and longevity of *X. herbacea* populations identified within Property F include:

- weed invasion
- degradation and grazing by cattle
- siltation following high flow events
- vegetation clearing
- degradation by feral animals (e.g. pigs)

The OMP to be prepared and approved by DCCEEW would include management measures for the protection and improvement of *X. herbacea* populations and habitat, such as:

- active revegetation in areas to improve the cover of native species
- weed control to reduce weed cover, avoid introduction of any new weed species and reduce competition with native species regeneration
- implementation of controlled livestock grazing regimes to encourage natural regeneration of native vegetation and prevent further degradation of habitat whilst assisting to reduce fuel load
- management of feral animals
- management of fuel levels to avoid high intensity bushfires.

6.1.3 EPBC Act offset policy principles

Table 9 demonstrates that potential offset Property F is consistent with the principles of the EPBC Act Environmental Offset Policy.

Table 7: Environment Offsets Policy Principles (*Xerothamnella herbacea*)

Offset principle	Assessment
Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is protected by national environmental law and affected by the action.	Property F has the potential to deliver a conservation outcome that improves or maintains the viability of <i>X. herbacea</i> . Over 2,000 individuals are considered to occur within the property, representing one of the largest known populations of this species. Protecting and enhancing this population (or part thereof) will contribute to the long-term survival of the species.

Offset principle	Assessment
Be built around direct offsets but may include other compensatory measures.	Property F provides greater than 100% of the Commonwealth offset requirements for <i>X. herbacea</i> individuals significantly impacted by the project (refer Offset assessment guide provided in Appendix D).
Be in proportion to the level of statutory protection that applies to protected matter.	Property F provides greater than 100% of the offset liability for <i>X. herbacea</i> individuals significantly impacted by the project (refer Offset assessment guide provided in Appendix D). If Property F (or part thereof) was to become the formal offset site for the project's impacts to the <i>X. herbacea</i> , they would be legally secured in perpetuity.
Be of a size and scale proportionate to the impacts on the protected matter.	The offset assessment guide has determined that Property F is proportionate to the significant impacts on <i>X. herbacea</i> associated with the project. Further, more than 2,000 individuals are estimated to occur within Property F, representing more than 22 times the number of individuals proposed to be removed by the project. Using this property as an offset site would more than meet the proportionality requirement of an offset for the project.
Effectively account for and manage the risks of the offset not succeeding.	The Offset assessment guide accounts for the risk of the offset not succeeding (refer Section 6.1.1 and Appendix D). Active and adaptive management of the offset site, once it has been secured, would reduce the risk of the offset not succeeding. Management measures, performance outcomes, monitoring programs and corrective actions would be documented in the OMP for the offset site.
Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs.	If Property F (or part thereof) was used as an offset site, additional conservation outcomes would be achieved through active and adaptive management actions designed to enhance ecological condition and habitat values, reduce risks and will be legally secured in perpetuity. Property F has a history of vegetation clearing and cattle grazing. These activities have contributed and continue to contribute to a loss and/or decline of <i>X. herbacea</i> populations. Securing an offset within this property would ensure conservation gains are achieved and that protection of the offset area is enduring and additional under duty of care or any environmental planning laws.
Be efficient, effective, transparent, proportionate, scientifically robust and reasonable.	The Offset assessment guide (refer Section 6.1.1 and Appendix D) has demonstrated Property F (or part thereof) would efficiently and effectively compensate for significant impacts to <i>X. herbacea</i> associated with the project. This BOS and the TEIAR (Eco Solutions & Management 2023) for the project, presents the methodology behind determining:

Offset principle	Assessment
	<ul style="list-style-type: none"> ▪ MNES present (or predicted to occur) within the project disturbance footprint and potential offset properties ▪ the area of the offset in comparison to the area of impact ▪ the connectivity and condition of the native vegetation / fauna habitat present. <p>Active and adaptive management of offsite sites is known to improve the ecological condition and improve the capacity of the offset to achieve conservation gains. The OMP will provide a set of clear, scientifically robust management measures designed to maximise the likelihood of the offset succeeding.</p>
<p>Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.</p>	<p>The OMP will provide at a minimum:</p> <ul style="list-style-type: none"> ▪ the number of <i>X. herbacea</i> present ▪ baseline habitat quality ▪ performance objectives to be achieved over prescribed timeframes ▪ monitoring program ▪ corrective actions ▪ monitoring and reporting requirements. <p>The OMP would be reviewed and approved by DCCEEW.</p>

6.2 Ornamental Snake

Potential habitat for this species was recorded in Properties A, B, C, D, E and F. A brief description of the habitat within each property is provided below.

- **Property A.** Two large patches of regenerating Brigalow that support gilgai on cracking clay soils were recorded in the eastern and western portions of this property (Figure 8). In addition, an Ornamental Snake was recorded during the October 2020 survey period. Quality of this habitat was found to be moderate due to a distinct lack of large trees, low canopy height, limited to variable species richness, low levels of fallen woody debris and moderate to high levels of non-native plant cover.
- **Property B.** Regrowth Brigalow woodland located within the western portion of this property provides potentially suitable habitat for Ornamental Snake (Figure 7). The habitat present was found to be moderate in quality due to a distinct lack of large trees, low canopy height, limited to variable species richness, low levels of fallen woody debris and moderate to high levels of non-native plant cover.
- **Property C.** The Coolibah woodland fringing Banana Creek has the potential to provide dispersal as well as foraging habitat, particularly in the south-eastern portion of the property. An incised channel is lacking at this location and instead a chain of small pools that generally support native aquatic flora species are a common feature in the floor of the creek channel.

Given that the presence of gilgai on cracking soils aren't present and that the habitat present is more likely to be primarily of value as dispersal habitat, this property wasn't considered further for Ornamental Snake.

- **Property D.** A small patch of regenerating Brigalow low woodland was recorded in the southern portion of this property. The patch supports gilgai on cracking clay soils however specimens of Ornamental Snake were not recorded within this patch during three separate spotlight surveys. A number of floodplain wetlands exist within this property; however, it is anticipated that their utilisation by Ornamental Snake is limited given the risks associated accessing these wetlands. Given the small size of the patch and lack of sightings, this property wasn't considered further for Ornamental Snake.
- **Property E.** Regrowth Brigalow low woodland subsist within the majority of this property and provides suitable habitat for Ornamental Snake (Figure 8). Two Ornamental Snakes were recorded within this property in February 2021. The habitat present was found to be moderate in quality due to a distinct lack of large trees, low canopy height, limited to variable species richness, low levels of fallen woody debris and moderate to high levels of non-native plant cover.
- **Property F.** Three relatively small patches of regenerating Brigalow woodland were recorded fringing Kianga Creek in the northern portion of this property. The patches do support gilgai on cracking clay soils, however the underlying substrate was a clay loam which limited the extent of surface cracking present, reducing the habitat suitability of these patches. Microhabitat in the form of fallen woody debris was relatively prevalent within the patches and Ornamental Snake has been recorded in reasonably large numbers in fragmented regenerating Brigalow low woodland on the property to the immediate north but was not recorded within this patch during spotlight surveys. However, the patches within Property F are more likely to be primarily of value as dispersal habitat due to the lack of prevalent surface cracking, and as such this property wasn't considered further for Ornamental Snake.

6.2.1 Offset assessment guide

The offset calculator component of the Offset assessment guide has been completed for areas of Ornamental Snake habitat recorded in Properties A, B and E (Appendix E) and a summary of the results are provided in Table 10.

Table 8: Offset calculator inputs for potential offset properties A, B and E

Variable	Value used and rationale		
	Property A	Property B	Property E
<p>Start habitat quality (raw data provided in Appendix E)</p>	<p><u>Value used: 5</u></p> <p><u>Condition score</u> (refer Section 4.2.2): 1 (rounded down from 1.1) The condition scores of habitat present were moderate due to a lack of large trees, low canopy height, limited to variable species richness, low levels of fallen woody debris and moderate to high levels of non-native plant cover.</p> <p><u>Context score</u> (refer Section 4.2.2): 1 (rounded up from 0.8) The site context scores were generally low due to the patches of habitat being isolated and surrounded by cleared pastoral land.</p> <p><u>Species stocking rate score</u> (refer Section 4.2.2): 3 (rounded up from 2.8). Ornamental Snake was recorded in suitable habitat. In addition, important microhabitat features were present, namely gilgai on cracking clay soils.</p>	<p><u>Value used: 4</u></p> <p><u>Condition score</u> (refer Section 4.2.2): 2 (rounded up from 1.7) Habitat present consists of regrowth Brigalow woodland. The habitat present was found to be moderate in quality due to a distinct lack of large trees, low canopy height, limited to variable species richness, low levels of fallen woody debris and moderate to high levels of non-native plant cover.</p> <p><u>Context score</u> (refer Section 4.2.2): 0 (rounded down from 0.4) The site context scores were low due to the limited extent of remnant vegetation in the vicinity of this portion of the lot and the lack of connectivity.</p> <p><u>Species stocking rate score</u> (refer Section 4.2.2): 3 (rounded down from 3.4). The species was not recorded during field surveys in this offset property. Quality and availability</p>	<p><u>Value used: 4</u></p> <p><u>Condition score</u> (refer Section 4.2.2): 1 (rounded down from 1.1) The condition scores of habitat present were moderate due to a lack of large trees, low canopy height, limited to variable species richness, low levels of fallen woody debris and moderate to high levels of non-native plant cover.</p> <p><u>Context score</u> (refer Section 4.2.2): 0 The site context scores were low due to the patches of habitat being isolated and surrounded by cleared pastoral land.</p> <p><u>Species stocking rate score</u> (refer Section 4.2.2): 3 (rounded down from 3.4). Ornamental Snake was recorded in suitable habitat. In addition, important microhabitat features were present, namely gilgai on cracking clay soils.</p>

Variable	Value used and rationale		
	Property A	Property B	Property E
		of habitat for foraging, sheltering and dispersal was variable across the habitat present.	
Future quality without offset	<p><u>Value used: 4</u> Habitat within this property is exposed to following threats:</p> <ul style="list-style-type: none"> ▪ cattle grazing and trampling of gilgai ▪ ongoing maintenance of regrowth Brigalow vegetation ▪ weed invasion and expansion. <p>If the property was not being actively managed as an offset, these pressures would continue to degrade the quality of the habitat present.</p>	<p><u>Value used: 3</u> Habitat within this property is exposed to following threats:</p> <ul style="list-style-type: none"> ▪ cattle grazing and trampling of gilgai ▪ ongoing maintenance of regrowth Brigalow vegetation ▪ weed invasion and expansion. <p>If the property was not being actively managed as an offset, these pressures would continue to degrade the quality of the habitat present.</p>	<p><u>Value used: 3</u> Habitat within this property is exposed to following threats:</p> <ul style="list-style-type: none"> ▪ cattle grazing and trampling of gilgai ▪ ongoing maintenance of regrowth Brigalow vegetation ▪ weed invasion and expansion. <p>If the property was not being actively managed as an offset, these pressures would continue to degrade the quality of the habitat present.</p>
Future quality with offset	<p><u>Value used: 6</u> It is anticipated with active and adaptive management the quality of habitat present will be improved through:</p> <ul style="list-style-type: none"> ▪ Removing degrading processes such as maintenance clearing of regrowth vegetation and sustained cattle grazing ▪ Reducing weed infestations 	<p><u>Value used: 7</u> It is anticipated with active and adaptive management the quality of habitat present will be improved through:</p> <ul style="list-style-type: none"> ▪ removing degrading processes such as maintenance clearing of regrowth vegetation and sustained cattle grazing ▪ reducing weed infestations 	<p><u>Value used: 6</u> It is anticipated with active and adaptive management the quality of habitat present will be improved through:</p> <ul style="list-style-type: none"> ▪ Removing degrading processes such as maintenance clearing of regrowth vegetation and sustained cattle grazing ▪ Reducing weed infestations

Variable	Value used and rationale		
	Property A	Property B	Property E
	<ul style="list-style-type: none"> Increasing the density and diversity of native flora. <p>However, given the surrounding landscape it is unlikely that it will be possible to maintain the offset as completely being weed free. In addition, cattle may be used to assist in managing fire hazards by fuel levels down.</p>	<ul style="list-style-type: none"> increasing the density and diversity of native flora. <p>However, given the surrounding landscape it is unlikely that it will be possible to maintain the offset as completely being weed free. In addition, cattle may be used to assist in managing fire hazards by fuel levels down.</p>	<ul style="list-style-type: none"> Increasing the density and diversity of native flora. <p>However, given the surrounding landscape it is unlikely that it will be possible to maintain the offset as completely being weed free. In addition, cattle may be used to assist in managing fire hazards by fuel levels down.</p>
Time over which loss is averted	<p><u>Value used: 20 years</u></p> <p>It is intended for the legally securing mechanism across the offset would be valid for a minimum of 20 years. This is generally the time it would take for regrowth vegetation within the offset area to reach remnant status and therefore be afforded ongoing protection under State and Commonwealth legislation.</p>	<p><u>Value used: 20 years</u></p> <p>It is intended for the legally securing mechanism across the offset would be valid for a minimum of 20 years. This is generally the time it would take for regrowth vegetation within the offset area to reach remnant status and therefore be afforded ongoing protection under State and Commonwealth legislation.</p>	<p><u>Value used: 20 years</u></p> <p>It is intended for the legally securing mechanism across the offset would be valid for a minimum of 20 years. This is generally the time it would take for regrowth vegetation within the offset area to reach remnant status and therefore be afforded ongoing protection under State and Commonwealth legislation.</p>
Time until ecological benefit	<p><u>Value used: 5 years</u></p> <p>Given the moderate quality of the habitat present, it is anticipated that with the implementation of specific management measures will start to realise ecological benefit within 5 years.</p>	<p><u>Value used: 5 years</u></p> <p>Given the moderate quality of the habitat present, it is anticipated that with the implementation of specific management measures will start to realise ecological benefit within 5 years.</p>	<p><u>Value used: 5 years</u></p> <p>Given the moderate quality of the habitat present, it is anticipated that with the implementation of specific management measures will start to realise ecological benefit within 5 years.</p>

Variable	Value used and rationale		
	Property A	Property B	Property E
Risk of loss without offset	<p><u>Value used: 90%</u> The property is currently used for cattle grazing and the habitat present is at risk of decline resulting from:</p> <ul style="list-style-type: none"> ▪ trampling by cattle ▪ maintenance of Brigalow regrowth vegetation ▪ weed invasion and expansion ▪ PMAV overlaying the property and coding the proposed habitat as Category X, i.e. legally able to be cleared. 	<p><u>Value used: 90%</u> The property is currently used for cattle grazing and the habitat present is at risk of decline resulting from:</p> <ul style="list-style-type: none"> ▪ trampling by cattle ▪ maintenance of Brigalow regrowth vegetation ▪ weed invasion and expansion ▪ PMAV overlaying the property and coding the proposed habitat as Category X, i.e. legally able to be cleared. 	<p><u>Value used: 90%</u> The property is currently used for cattle grazing and the habitat present is at risk of decline resulting from:</p> <ul style="list-style-type: none"> ▪ trampling by cattle ▪ maintenance of Brigalow regrowth vegetation ▪ weed invasion and expansion ▪ PMAV overlaying the property and coding the proposed habitat as Category X, i.e. legally able to be cleared.
Risk of loss with offset	<p><u>Value used: 5%</u> Legally securing the area as an environmental offset will provide protection from degrading processes such as clearing and sustained cattle grazing. Active management of the area as offset will improve the quality of the habitat present through weed management and increased floristic diversity.</p>	<p><u>Value used: 5%</u> Legally securing the area as an environmental offset will provide protection from degrading processes such as clearing and sustained cattle grazing. Active management of the area as offset will improve the quality of the habitat present through weed management and increased floristic diversity.</p>	<p><u>Value used: 5%</u> Legally securing the area as an environmental offset will provide protection from degrading processes such as clearing and sustained cattle grazing. Active management of the area as offset will improve the quality of the habitat present through weed management and increased floristic diversity.</p>
Confidence in result	<p><u>Value used: 95%</u> Active and adaptive management of offsite sites is known to improve</p>	<p><u>Value used: 95%</u> Active and adaptive management of offsite sites is known to improve</p>	<p><u>Value used: 95%</u> Active and adaptive management of offsite sites is known to improve</p>

Variable	Value used and rationale		
	Property A	Property B	Property E
	<p>the ecological condition and improve the capacity of the offset to achieve conservation gains.</p> <p>The habitat present is likely to have a moderate to high degree of resilience given:</p> <ul style="list-style-type: none"> ▪ there are sufficient numbers of native flora species present to regenerate and colonise the offset once degrading processes have been removed ▪ Ornamental Snake was recorded in the habitat in its current condition ▪ Gilgai formations and other microhabitat features (e.g. cracking clay soils) for the Ornamental Snake are already present. 	<p>the ecological condition and improve the capacity of the offset to achieve conservation gains.</p> <p>The habitat present is likely to have a moderate degree of resilience given:</p> <ul style="list-style-type: none"> ▪ there are sufficient numbers of native flora species present to regenerate and colonise the offset once degrading processes have been removed ▪ Gilgai formations and other microhabitat features (e.g. cracking clay soils) for the Ornamental Snake are already present. 	<p>the ecological condition and improve the capacity of the offset to achieve conservation gains.</p> <p>The habitat present is likely to have a moderate to high degree of resilience given:</p> <ul style="list-style-type: none"> ▪ there are sufficient numbers of native flora species present to regenerate and colonise the offset once degrading processes have been removed ▪ Ornamental Snake was recorded in the habitat in its current condition ▪ Gilgai formations and other microhabitat features (e.g. cracking clay soils) for the Ornamental Snake are already present.

The application of these values in the EPBC Act offset calculator yields the following offset outcome percentages:

- Property A - 487.14%
- Property B - 73.32%
- Property E - 509.81%.

6.2.2 Recommended management measures

Existing threats to the condition and longevity of areas of the Ornamental Snake habitat identified within Properties A, B and E include:

- weed invasion
- restricted movement due to density of exotic grasses
- vegetation clearing and/or thinning
- fire
- degradation and grazing by cattle
- degradation by pigs

The OMP to be prepared and approved by DCCEEW would include management measures for the protection and improvement of the Ornamental Snake habitat, such as:

- active revegetation to improve the cover of native species
- weed control to reduce weed cover, avoid introduction of any new weed species and reduce competition with native species regeneration
- habitat enhancement through supplementing fallen woody debris where practicable
- management of feral animals
- implementation of controlled livestock grazing regimes to encourage natural regeneration of native vegetation and prevent further degradation of habitat whilst assisting to reduce fuel load
- management of fuel levels to avoid high intensity bushfires.

6.2.3 EPBC Act offset policy principles

Table 11 provides an analysis of the relevant potential offset properties to achieve the principles of the EPBC Act Environmental Offset Policy.

Table 9: Environment Offsets Policy Principles (Ornamental Snake)

Offset principle	Assessment
Deliver an overall conservation outcome that improves or maintains the viability of the aspect of the environment that is	Habitat within Properties A, B and/or E has the potential to deliver a conservation outcome that improves or maintains the viability of the Ornamental Snake.

Offset principle	Assessment
protected by national environmental law and affected by the action.	
Be built around direct offsets but may include other compensatory measures.	Properties A and E have the potential to meet greater than 100% of the Commonwealth offset requirements for Ornamental Snake habitat significantly impacted by the project each in their own right (refer Offset assessment guide provided in Appendix E). Using Properties A or E, or a combination of areas from Properties A, B and/or E as an offset site can meet the offset obligations for the Ornamental Snake.
Be in proportion to the level of statutory protection that applies to protected matter.	Properties A and E have the potential to provide greater than 100% of the offset liability for Ornamental Snake habitat in their own right (refer Offset assessment guide provided in Appendix E). If Properties A, B and/or E (part thereof or a combination of areas within one or more of these properties) were to become the formal offset site for the project's impacts to the Ornamental Snake, they would be legally secured in perpetuity.
Be of a size and scale proportionate to the impacts on the protected matter.	The offset assessment guide has determined that Properties A and E or a combination of areas from Properties A, B and/or E would be of a suitable size and scale proportionate to the impacts on the Ornamental Snake associated with the project.
Effectively account for and manage the risks of the offset not succeeding.	The Offsets assessment guide accounts for the risk of the offset not succeeding (refer Section 6.1.1 and Appendix E). Active and adaptive management of the offset site, once it has been secured, would reduce the risk of the offset not succeeding. Management measures, performance outcomes, monitoring programs and corrective actions would be documented in the OMP for the offset site.
Be additional to what is already required, determined by law or planning regulations or agreed to under other schemes or programs.	Additional conservation outcomes would be achieved through active and adaptive management actions designed to enhance ecological condition and habitat values, reduce risks and will be legally secured in perpetuity. Properties A, B and E are currently freehold and have a history of vegetation clearing and cattle grazing. These activities have contributed and continue to contribute to a loss and/or decline of Ornamental Snake habitat. Securing an offset within these properties will ensure conservation gains are achieved and that protection of the offset area is enduring and additional under duty of care or any environmental planning laws.
Be efficient, effective, transparent, proportionate, scientifically robust and reasonable.	The Offset assessment guide (refer Section 6.1.1 and Appendix D) has demonstrated that Properties A, B and E, or a portion of one or more of the properties, would efficiently and effectively

Offset principle	Assessment
	<p>compensate for significant impacts to Ornamental Snake associated with the project.</p> <p>This BOS and the TEIAR (Eco Solutions & Management 2023) for the project, presents the methodology behind determining:</p> <ul style="list-style-type: none"> ▪ MNES present (or predicted to occur) within the project disturbance footprint and potential offset properties ▪ the area of the offset in comparison to the area of impact ▪ the connectivity and condition of the native vegetation / fauna habitat present. <p>Active and adaptive management of offsite sites is known to improve the ecological condition and improve the capacity of the offset to achieve conservation gains. The OMP will provide a set of clear, scientifically robust management measures designed to maximise the likelihood of the offset succeeding.</p>
<p>Have transparent governance arrangements including being able to be readily measured, monitored, audited and enforced.</p>	<p>The OMP will provide at a minimum:</p> <ul style="list-style-type: none"> ▪ the areas of Ornamental Snake present ▪ baseline habitat quality ▪ performance objectives to be achieved over prescribed timeframes ▪ monitoring program ▪ corrective actions ▪ monitoring and reporting requirements. <p>The OMP would be reviewed and approved by DCCWWE.</p>

7 Conclusions

This Biodiversity Offsets Strategy details how the proponent can meet biodiversity offset obligations for the impacts to the two MNES assessed as being significantly impacted by development of the Baralaba South Project.

The BOS details how the significant residual impact to *Xerothamnella herbacea* and Ornamental Snake, could be met through a direct offset land-based mechanism.

The BOS demonstrates there is suitable land-based offset options through a combination of one or more properties (or part thereof) which will meet the obligation. Property F has been demonstrated to provide a suitable offset for *Xerothamnella herbacea* and either Property A or Property B are suitable offset sites for the Ornamental Snake. At this stage, it is the proponent's intention to provide an offset through legally securing an offset site within the areas identified in this report. However, the proponent may pursue offset options on other properties in addition to, or instead of, those properties identified within the report.

Whichever land-based option is selected to deliver the required offset, appropriate legal security will be applied to the offset site(s).

An Offset Management Plan (OMP) will be developed for each offset site and will include the management measures, performance objectives, responsibilities, corrective action and timeframes for delivery. The management measures developed will be MNES specific and designed to improved ecological condition and improve the capacity of the offset to achieve conservation gains. The OMP(s) will be prepared and approved by DCCEE prior to the commencement of the action.

Additionally, the Commonwealth offset policy allows up to 10% of the offset obligation to be delivered through other compensatory measures, such as education or research. If the identified land-based offset cannot meet 100% of the offset obligation, the proponent may pursue such a compensatory measure.

8 References

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Canberra. <http://www.environment.gov.au/epbc/publications/pubs/offsets-policy.pdf>.

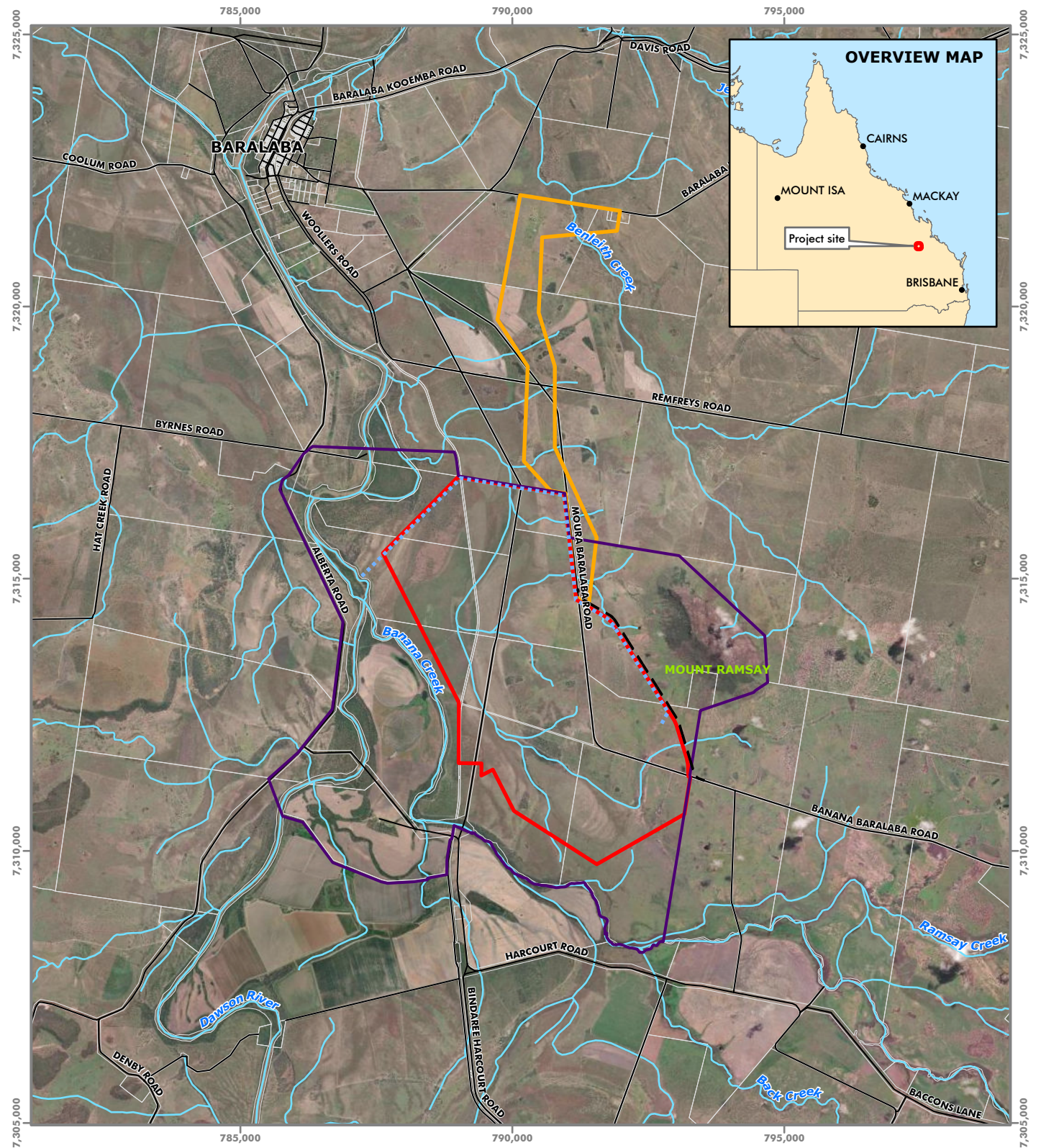
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TSSC, (2008). *Approved Conservation Advice for Xerothamnella herbacea*. Department of the Environment, Australian Government, Canberra. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=4146, Canberra.

Figures



- Legend**
- Project Site (MLA 700057)
 - ETL (electricity transmission line) study area
 - Additional investigation area
 - Water release/extracton infrastructure
 - Proposed Maura Baralaba road realignment
 - Road
 - Vegetation Management Act watercourse
 - Cadastral boundary

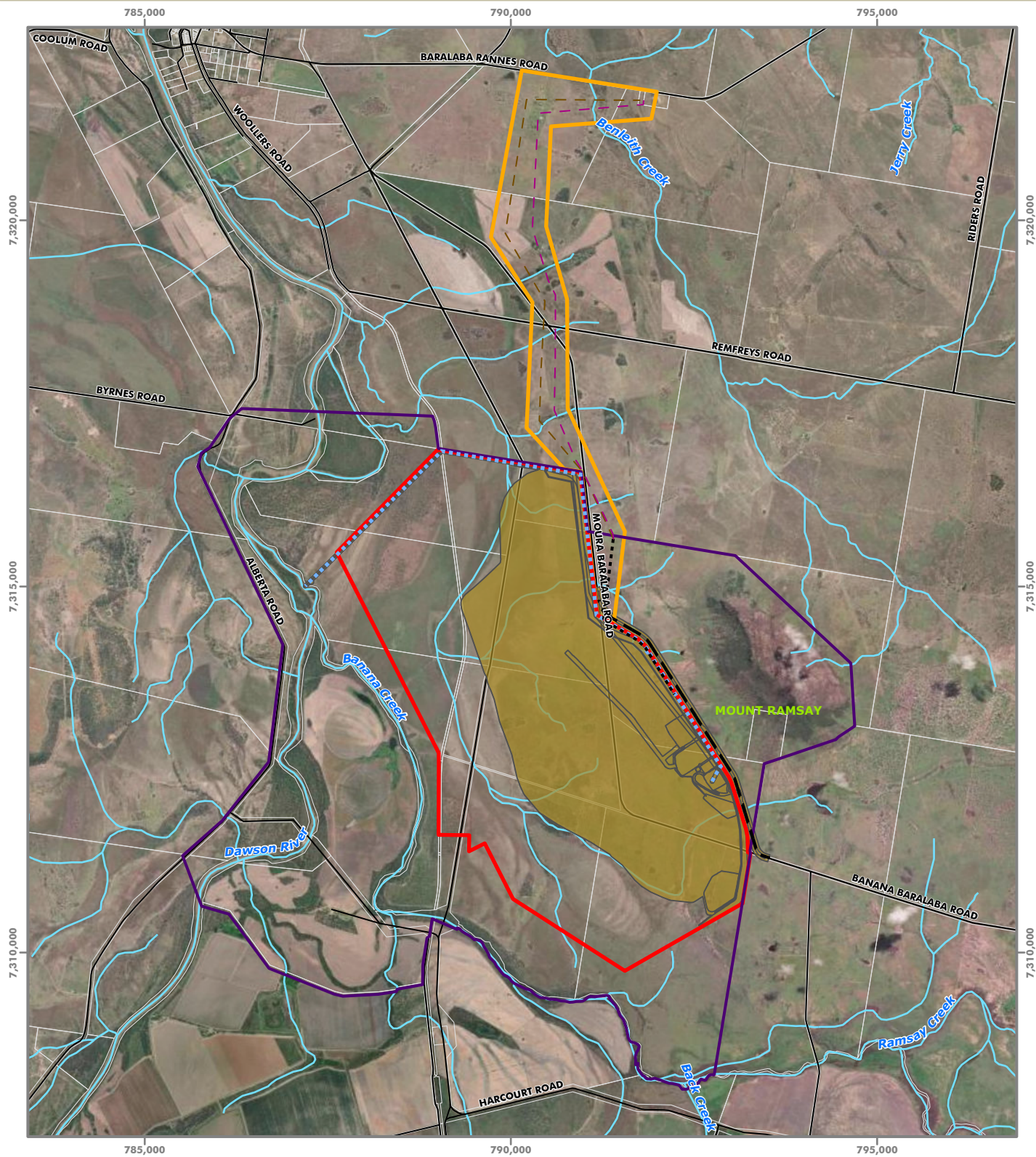
Figure 1 : Project location
 Baralaba South Project
 Biodiversity Offset Strategy

Map Number: 20044_BOS3_01_A
 Date: 26 October 2023
 Map Projection: GDA2020 MGA Zone 55
 Imagery: (c) Digital Globe
 Data: Roads, Watercourse, DCDB - (c)DNRM 2023

0 1 2 3 4 5
 Kilometers

N

ECO SOLUTIONS & MANAGEMENT



Legend

- Project Site (MLA 700057)
- ETL (electricity transmission line) study area
- Additional investigation area
- Proposed Moura Baralaba road realignment
- Road
- Vegetation Management Act watercourse
- Cadastral boundary

Project layout

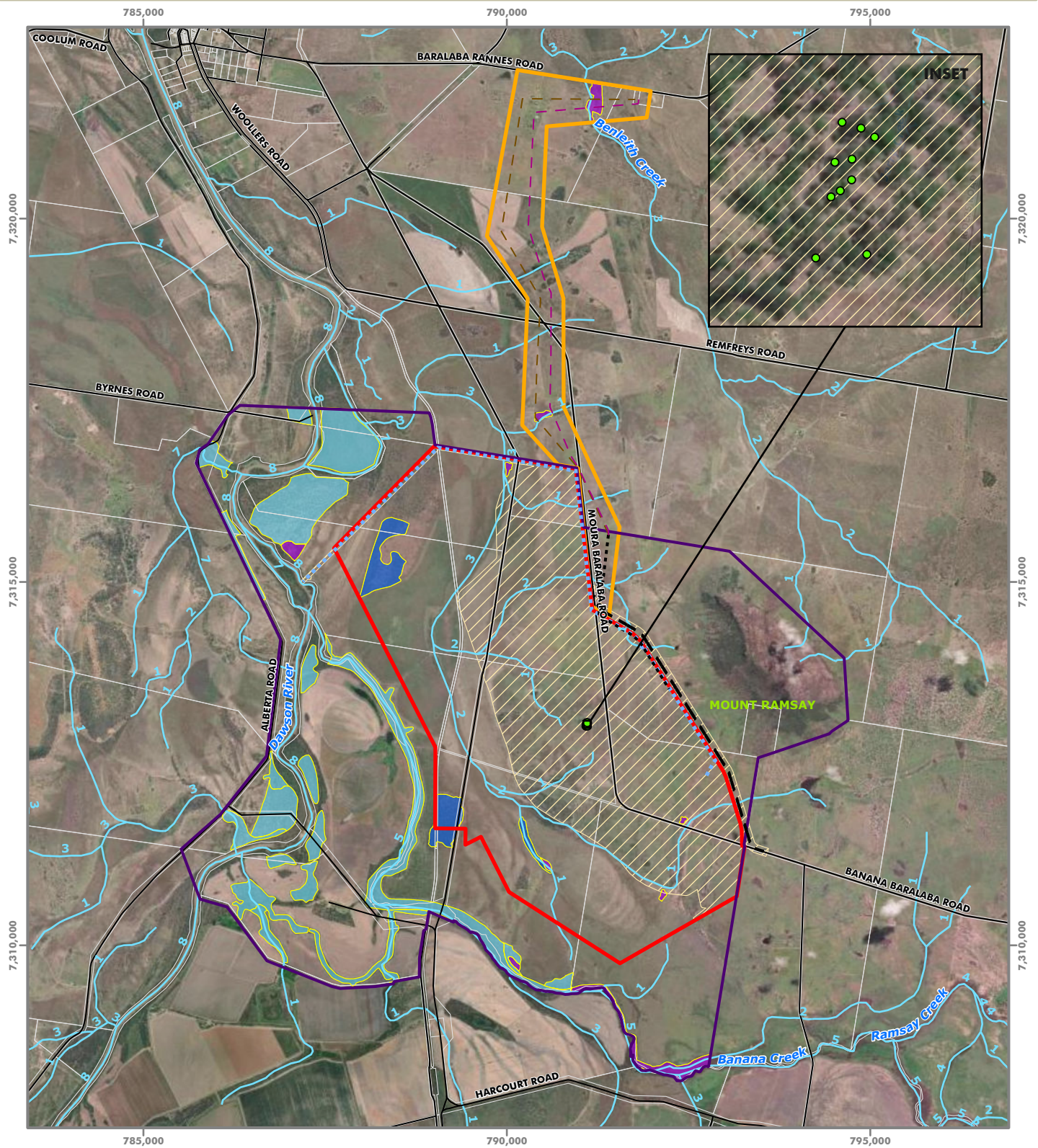
- Water release/extraction infrastructure
- ETL alignment (option 1)
- ETL alignment (option 2)
- Proposed Mine Site ETL
- Infrastructure layout
- Mine footprint

Figure 2 : Project layout

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_02_A
Date: 26 October 2023
Map Projection: GDA 1994 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2023





Legend

- Project Site (MLA 700057)
- ETL (electricity transmission line) study area
- Additional investigation area
- Disturbance footprint
- Water release/extraction infrastructure
- ETL alignment (option 1)
- ETL alignment (option 2)
- Proposed Mine Site ETL
- Proposed Maura Baralaba road realignment
- Road
- Vegetation Management Act watercourse
- Cadastral boundary

Threatened ecological communities

- Brigalow (Acacia harpophylla dominant and co-dominant)
- Coolibah – Black Box woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
- Potential to contribute to the Coolibah - Black Box woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions

Recorded locations

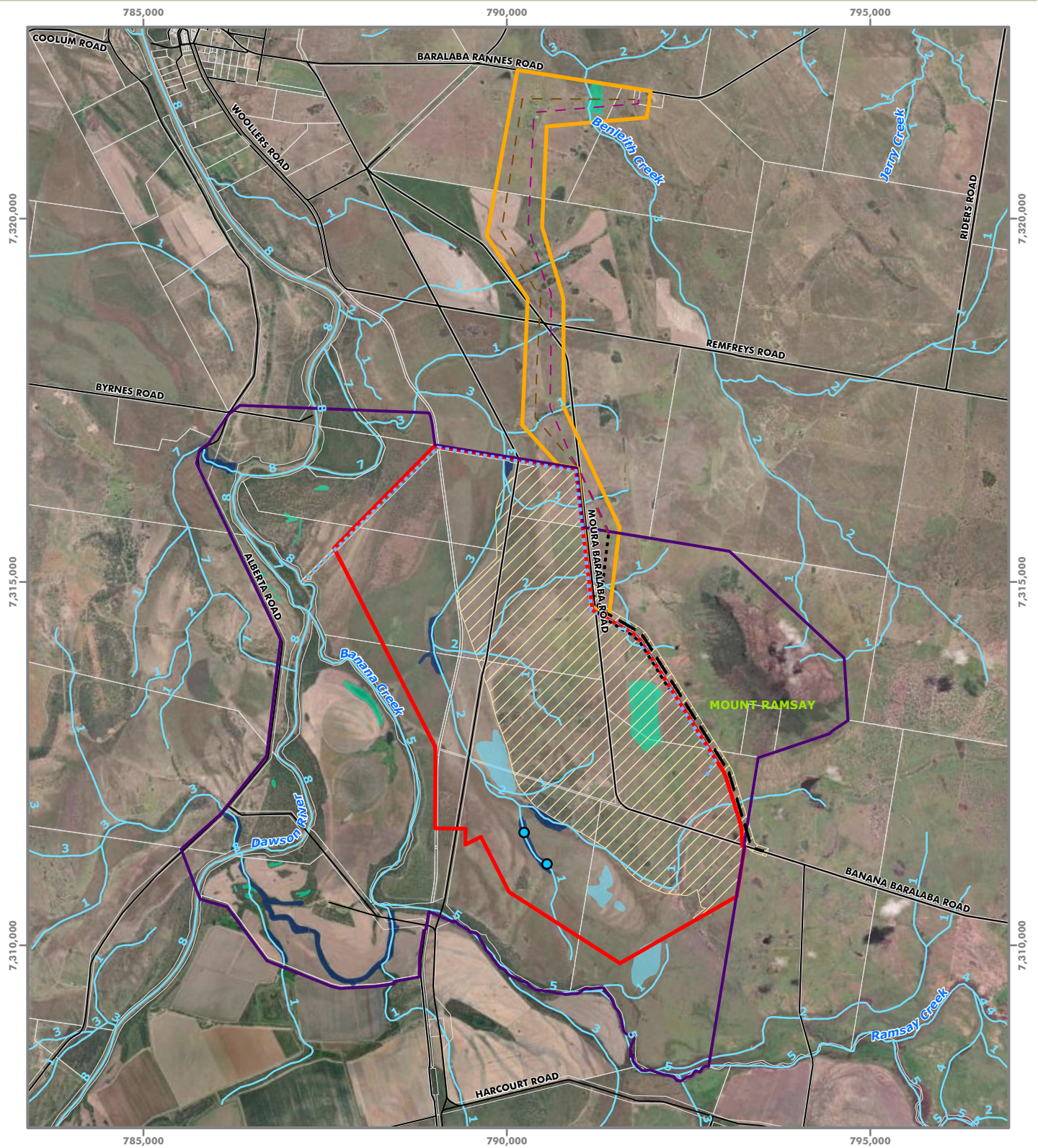
- Xerothamnella herbacea* (no common name) - Endangered (EPBC Act and NC Act)

Figure 3 : Threatened ecological community and flora

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_03_A
Date: 26 October 2023
Map Projection: GDA2020 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2022





Legend

- Project Site (MLA 700057)
- ETL (electricity transmission line) study area
- Additional investigation area
- Disturbance footprint
- Water release/extraction infrastructure
- ETL alignment (option 1)
- ETL alignment (option 2)
- Proposed Mine Site ETL
- Proposed Moura Baralaba road realignment
- Road
- Vegetation Management Act watercourse
- Cadastral boundary

Recorded location

- Ornamental Snake (*Denisonia maculata*) – Vulnerable (EPBC Act and NC Act)

Habitat mapping

Ornamental Snake (*Denisonia maculata*) – Vulnerable (EPBC Act and NC Act)

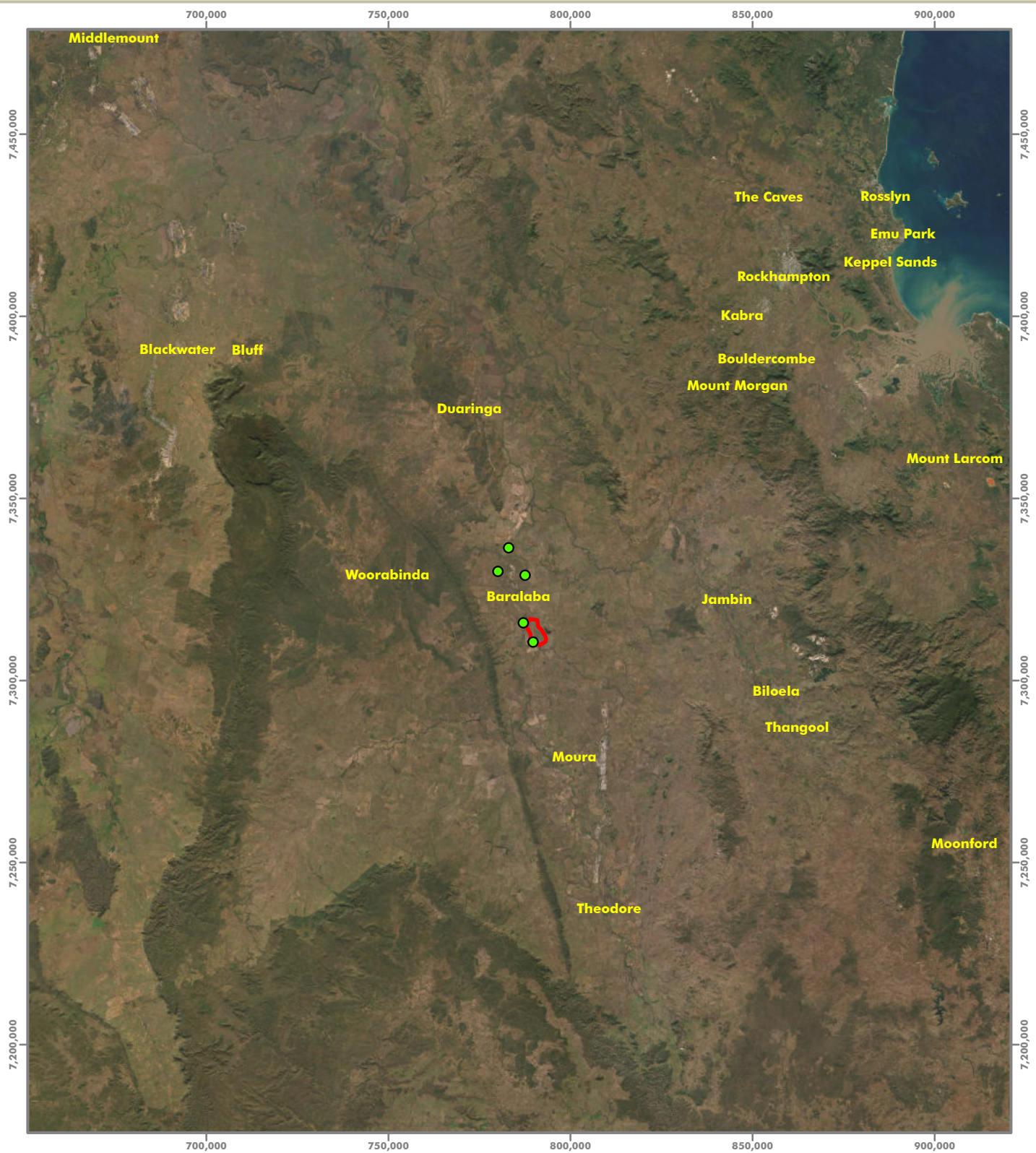
- Drainage lines with fringing vegetation and some fallen timber
- Gilgai and wetland habitat (with or without vegetation or fallen timber)
- Marginal gilgai habitat (without vegetation or fallen timber)

Figure 4 : Ornamental Snake records and habitat

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_04_A
Date: 26 October 2023
Map Projection: GDA2020 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2022





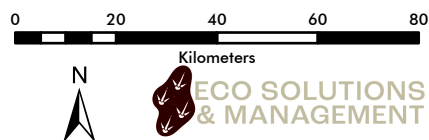
Legend

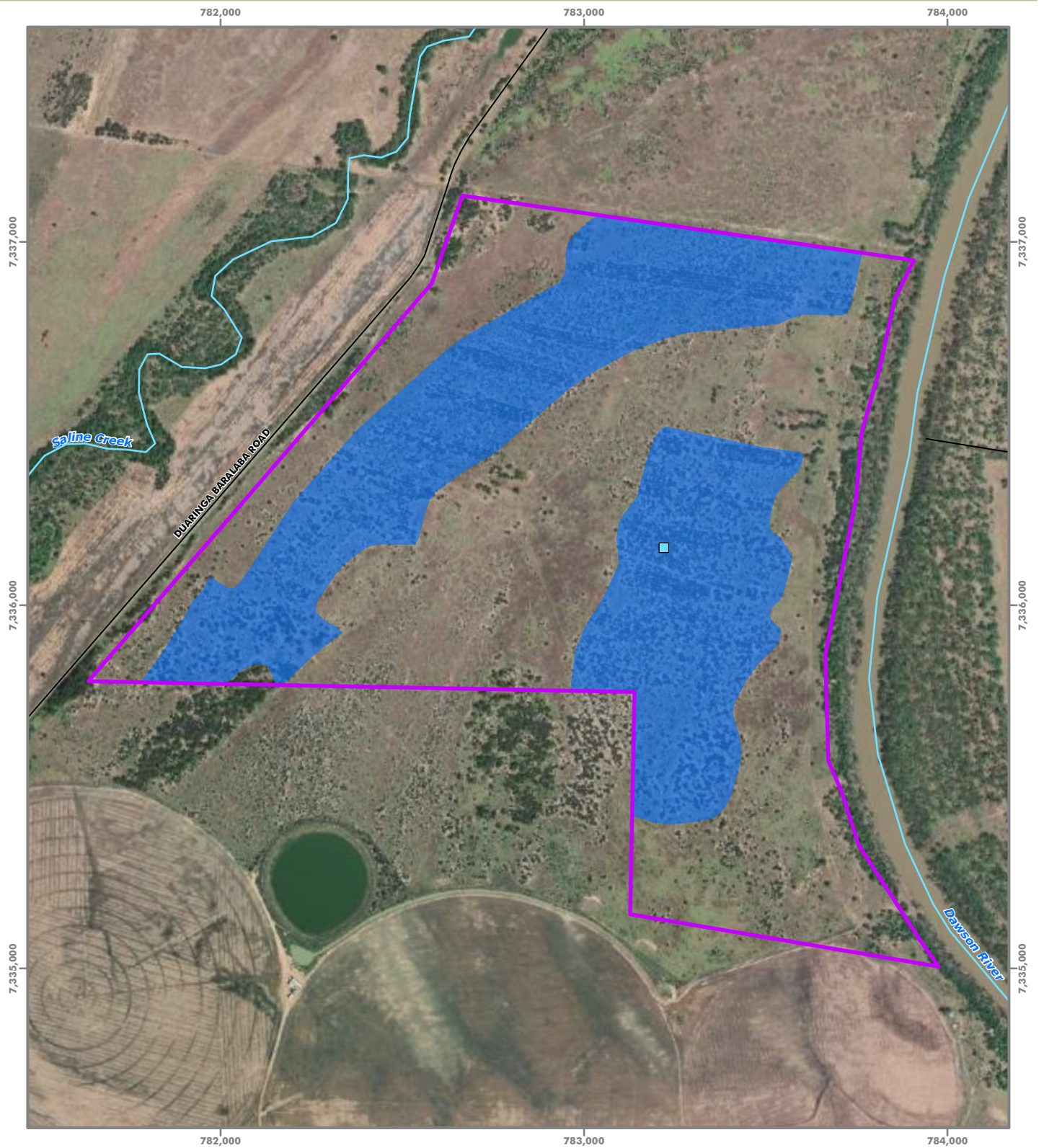
- Potential offset sites
- Project Site (MLA 700057)

Figure 5 : Location of potential offset properties

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_05_A
Date: 26 October 2023
Map Projection: GDA2020 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2023





Legend

- Property A
- Road
- Vegetation Management Act watercourse

Recorded locations

- Ornamental Snake (*Denisonia maculata*) - vulnerable (EPBC Act and NC Act)

Habitat mapping

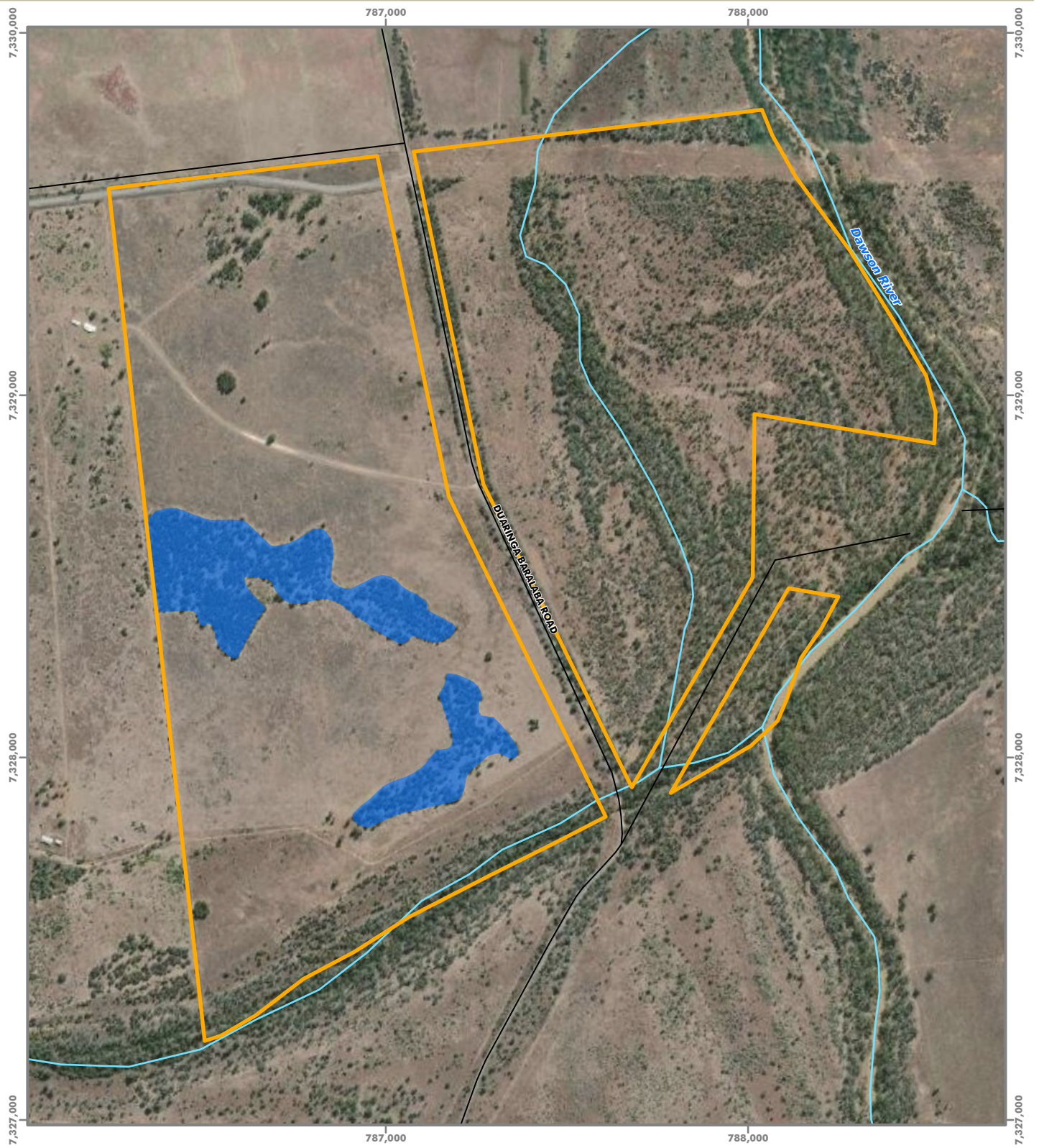
- Ornamental Snake (*Denisonia maculata*) - vulnerable (EPBC Act and NC Act)

Figure 6 : Property A - Ornamental Snake habitat and records

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_06_A
Date: 26 October 2023
Map Projection: GDA2020 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2023





Legend

- Property B
- Road
- Vegetation Management Act watercourse

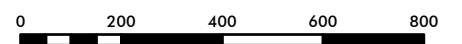
Habitat mapping

- Ornamental Snake (*Denisonia maculata*) - vulnerable (EPBC Act and NC Act)

Figure 7 : Property B - Ornamental Snake habitat

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_07_A
Date: 26 October 2023
Map Projection: GDA2020 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2023





Legend

- Property E
- Road
- Vegetation Management Act watercourse

Recorded locations

- Ornamental Snake (*Denisonia maculata*) - vulnerable (EPBC Act and NC Act)

Habitat mapping

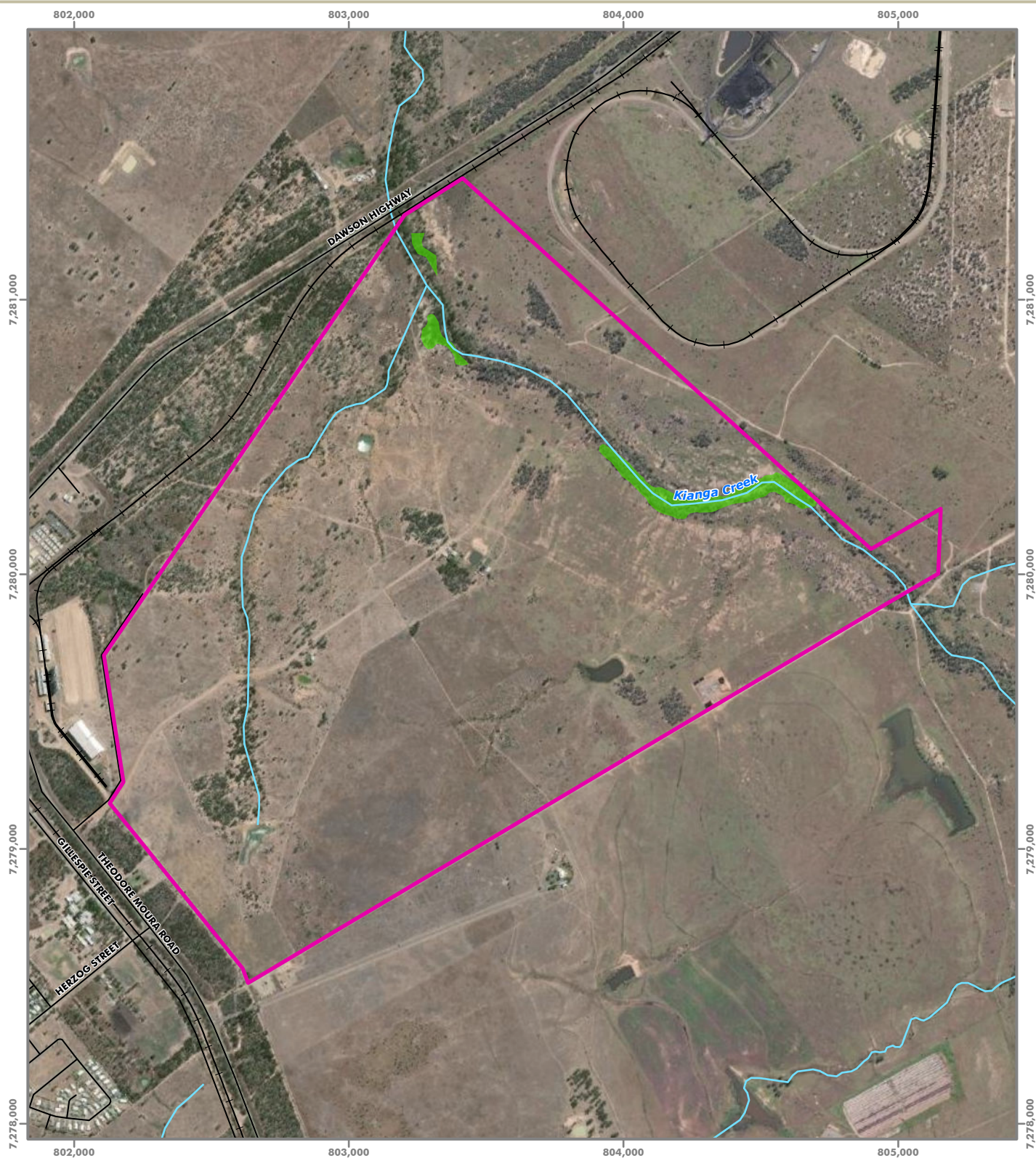
- Ornamental Snake (*Denisonia maculata*) - vulnerable (EPBC Act and NC Act)

Figure 8 : Property E - Ornamental Snake habitat

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_08_A
Date: 26 October 2023
Map Projection: GDA2020 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2023





Legend

- Property F
- Road
- Railway reserve
- Vegetation Management Act watercourse

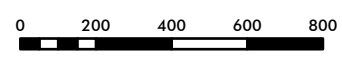
Habitat mapping

- Xerothamnella herbacea* (no common name) - endangered (EPBC Act and NC Act)

Figure 9 : Property F - *Xerothamnella herbacea* habitat

Baralaba South Project
Biodiversity Offset Strategy

Map Number: 20044_BOS3_09_A
Date: 26 October 2023
Map Projection: GDA2020 MGA Zone 55
Imagery: (c) Digital Globe
Data: Roads, Watercourse, DCDB - (c)DNRM 2023



Appendix A

Methodology for scoring species habitat indices - Ornamental Snake

Ornamental Snake (*Denisonia maculata*)

1. Quality and availability of foraging habitat

Indicator	Description			Score
Presence, abundance and variety of gilgai and wetland habitat	5	20	40	40
	Sparse, isolated gilgai or wetland habitat with minimal surrounding deep cracking soil or no gilgai present	Multiple gilgai present within assessment unit with some variety of depth and size. Geology that supports deep cracking soil	Abundant connected gilgai or large areas of suitable wetland with a variety of size and depth on suitable cracking clay geology.	
	1	7	15	
Vegetation structure	Cleared paddocks dominated by exotic grass species.	Regrowth vegetation with some areas of leaf litter and woody debris.	Remnant or advanced regrowth with abundant areas of deep leaf litter, coarse woody debris and native tussock grasses.	15
	Total			

Rationale

The species is a habitat specialist with few records occurring outside of gilgai and cracking clay habitats. This species is most commonly found in vegetation communities that occur on Cainozoic clay plains, with REs 11.4.3, 11.4.6, 11.4.8 and 11.4.9 representing the most common Regional Ecosystems in which this species has been recorded (DAWE, 2020). This species has also been recorded on REs 11.3.3 and 11.5.16 (DAWE, 2020), as well as RE 11.9.5 and non-remnant vegetation where gilgai are prevalent (Marston *pers comms*). The capacity of soils within gilgai systems to form deep cracks and retain ponded areas following rainfall, appears to be the main criteria for the distribution and preferential selection of gilgai habitats by the species (Veary et al., 2011).

The diet of this species consists predominately of frogs and particularly frogs of the *Cyclorana* genus (TSSC, 2016). The prey species of Ornamental Snake are associated with gilgai, cracking clay soils and ephemeral water bodies. As an example, a high abundance of snakes at a site near Nebo was observed to coincide with an abundance of young frogs emerging from an ephemeral pool (DAWE, 2020).

The quality of gilgai habitat will be assessed during field surveys and will be determined by assessing the presence, abundance and variety of gilgai habitat within an assessment unit. Gilgai presence will require consultation of current and historic aerial photographic imagery and walking areas of the assessment unit with apparent gilgai formations. This indicator will be measured qualitatively based on the combination of size, depth, bank angle and vegetation structure of gilgai within the assessment unit.

Assessment units that show no indication of gilgai and cracking soils and are not on land zone 4 (with an exemption for gilgai formations on land zone 9) will not be considered suitable habitat for the species.

2. Quality and availability of habitat required for shelter and breeding

Indicator	Description			Score
Presence, abundance and variety of gilgai habitat	0 Sparse, isolated gilgai or wetland habitat with minimal surrounding deep cracking soil or no gilgai present	5 Multiple gilgai present within assessment unit with some variety of depth and size. Geology that supports deep cracking soil	10 Abundant connected gilgai or large areas of suitable wetland with a variety of size and depth on suitable cracking clay geology.	10
Presence of ground timber, deep leaf litter and tussock grass	Low (1) Sparse tussock grass and coarse woody debris	Moderate (3) Moderate abundance of tussock grass and coarse woody debris across the patch	High (5) Abundant tussock grass and coarse woody debris particularly adjacent or close to gilgai	5
Total				15

Rationale

The species is known to seek refuge during dry periods in deep cracking clay associated with gilgai habitat (DAWE, 2020). The species is not known to leave gilgai habitat for breeding purposes. The presence and abundance of gilgai habitat within an assessment unit is the most important characteristic of quality and availability of habitat required for shelter and breeding. While the habitat conducive to the species is likely to be governed by underlying soil, in periods of extreme rainfall the species has been observed utilising the dense cover of tussock grasses for diurnal shelter (Veary, 2011). The species is also thought to shelter in logs and under coarse woody debris and ground litter (DAWE, 2020).

Both of these indicators will be determined during field survey assessments through habitat quality plots and visual qualitative assessments.

3. Quality and availability of habitat required for mobility

Indicator	Description			Score
Presence, abundance and variety of gilgai	0 Sparse, isolated gilgai or wetland habitat with minimal surrounding deep cracking soil or no gilgai present	3 Suitable wetland or gilgai present with some variety of depth and size. Geology that supports deep cracking soil	5 Abundant connected gilgai or large areas of suitable wetland with a variety of size and depth on suitable cracking clay geology.	5
Vegetation structure	0 Cleared paddocks dominated by exotic grass species.	3 Regrowth vegetation with some areas of leaf litter and woody debris.	5 Remnant or advanced regrowth with abundant areas of deep leaf litter, coarse woody debris and native tussock grasses.	5
Patch size	Low (1) No adjacent suitable habitat. Habitat patch <10 Ha.	Moderate (3) Some adjacent suitable habitat. Habitat patch >10 Ha.	High (5) Significant adjacent suitable habitat. Habitat patch >20 Ha.	5
Total				15

Rationale

A study conducted in Central Queensland in 2009 found that the species is primarily restricted to gilgai habitat and does not move in or out of adjacent habitats during seasonal variation of conditions (Veary et al., 2011). Therefore, the abundance, variety and connectivity of gilgai habitat within an assessment unit is a vital aspect of habitat quality required for mobility. Sites where the species have been recorded in abundance are also in habitat patches that are typically greater than 10 hectares in area and are within or connected, to larger areas of remnant vegetation (DAWE, 2020).

4. Absence of threats

Indicator	Description			Score
Potential for habitat loss or fragmentation	High (1) Habitat within the assessment unit is	Moderate (3) Habitat within the assessment unit is	High (5) Habitat within the assessment unit	5

Indicator	Description			Score
	located in an area that is likely to be degraded for infrastructure of agriculture.	located in an area that will be potentially degraded.	not likely to be degraded.	
Presence and abundance of livestock or feral pigs	High (1) Livestock or pigs abundant with obvious ground compaction and over grazing in gilgai habitat.	Moderate (3) Livestock or pigs present in moderate to low numbers with some indications of ground compaction and grazing in gilgai habitat.	High (5) Livestock or pigs not present	5
Presence and abundance of Cane Toads	High (1) Cane toads present throughout habitat. Toad tadpoles present in standing water.	Moderate (3) Occasional mature cane toads observed.	High (5) No Cane Toads observed.	5
Total				15

Rationale

The Approved Conservation Advice for the species (TSSC, 2016) lists the main threat identified to the Ornamental Snake is a continued legacy of past broadscale land clearing and habitat degradation. As the species appears to reside at shallow depths within the soil profile, any process which disturbs the land form of gilgai habitats such as clearing, ploughing or the development of access tracks has the potential to significantly impact the species (Veary et al., 2011). The species is highly susceptible to the impacts of cattle grazing during periods when gilgai support water as cattle access can significantly alter the structure and integrity of gilgai form and function (Veary et al., 2011). The destruction of wetland habitats by feral pigs is also likely a threat (TSSC, 2016). The species has been observed to persist in areas where Cane Toads are present, however the species is susceptible to the Cane Toad toxin and death is highly likely if a Cane Toad is bitten or consumed (Veary et al., 2011).

The risk habitat loss, fragmentation and degradation will be determined by assessing the state and federal status of the vegetation which defines an assessment unit. Threatened regional ecosystems (state) and threatened ecological communities (Commonwealth) have a greater level of legislative protection and hence the likelihood of that patch being cleared is reduced. There are numerous factors that can contribute to the degree of risk that an assessment unit might be cleared, such as:

- the vegetation within the assessment unit is on freehold land and is listed as Category X (non-remnant vegetation) or Category B (remnant vegetation)
- the assessment unit is located under an existing PMAV
- the assessment unit is located on a mining lease or within an infrastructure corridor

- the assessment unit is protected under an approved offset management plan and tenure arrangement.

This indicator will be determined through desktop analysis of relevant local, State and Commonwealth databases.

The presence and abundance of cattle, feral pigs and Cane Toads will be estimated by indicators such as direct observation, scats and tracks during field surveys.

References

- DAWE. (2020). *Denisonia maculata SPRAT Profile*. Department of Agriculture, Water and the Environment, Australian Government, Canberra. http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1193.
- Marston, S (2010). *Personal Communication*. Brendale, Queensland: Ecological Survey & Management.
- Veary, A. T, Veary, E. L., Burgess, J and Fell, D. (2011). Assessment of Habitat Characteristics as Predictors of Habitat Suitability for the Threatened Ornamental Snake. Unpublished report and on-going research on behalf of the Australian Coal Association Research Program, Research Project C15044.

Appendix B

Habitat quality scoring – impact site raw data

Table B-1: AU 1 [11.3.1 (HVR)]

Assessment Type:		IMPACT								
Assessment Site No.:		HQP 1a			HQP 2a			HQP 8a		
Polygon No. (Figure 20044_HQAIS_04_D)		A			C			AA		
Polygon area (ha)		0.98			1.22			1.23		
Total Assessment Unit Area (ha):		3.43								
Regional Ecosystem	11.3.1	11.3.1 (HVR)								
BVG	25a	25a			25a			25a		
Ecological Condition Indicator	Benchmark	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score
1. Recruitment of woody perennial species (%)	100	0	0.00%	0	50	50.00%	3	100	100.00%	5
2. Native plant species richness (No.):										
- Trees	3	1	33.33%	2.5	3	100.00%	5	3	100.00%	5
- Shrubs	5	2	40.00%	2.5	4	80.00%	2.5	3	60.00%	2.5
- Grasses	4	3	75.00%	2.5	4	100.00%	5	2	50.00%	2.5
- Forbs	8	8	100.00%	5	16	200.00%	5	14	175.00%	5
3. Tree canopy height (m):										
- Canopy Layer	14	9.10	65.00%	3	13.80	98.57%	5	11.31	80.79%	5
- Sub-Canopy Layer	4	6.00	150.00%	5	9.60	240.00%	5	7.46	186.50%	5
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				4			5			5
4. Tree canopy cover (%):										
- Canopy Layer	29	38.90	134.14%	5	38.15	131.55%	5	22.10	76.21%	5
- Sub-Canopy Layer	9	3.50	38.89%	2	12.95	143.89%	5	5.45	60.56%	5
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				3.5			5			5
5. Shrub canopy cover (%):	8	0.00	0.00%	0	0.00	0.00%	0	0	0.00%	0
6. Native perennial grass cover (%):	8	0.00	0.00%	0	0.20	2.50%	0	0	0.00%	0
7. Organic litter (%):	34	7.20	21.18%	3	9.70	28.53%	3	45	132.35%	5
8. Large trees/ha [combined: euc & non-euc]										
- euc (> cm)	n/a	n/a			n/a			n/a		
- non-euc (>29 cm)	170	10			50			60		
Total Large Trees	170	10	5.88%	5	50	29.41%	5	60	35.29%	5
9. Coarse woody debris (m/ha):	1752	54.00	3.08%	0	810	46.23%	2	35	2.00%	0
10. Non-native plant cover (%):	0	93.80	93.80%	0	38.50	38.50%	3	86.30	86.30%	0
Site Condition Score				28			43.5			40
1. Size of patch (Fragmented) [ha]	n/a	1	-	0	1	-	0	7	-	2
2. Connectedness (Fragmented) [%]	n/a	0	-	0	0	-	0	0	-	0
3. Context (Fragmented) [%]	n/a	0	-	0	0	-	0	4	-	0
Site Context Score:				0			0			2
1. Quality & availability of food and habitat for foraging							30			45
2. Quality & availability of habitat required for shelter and breeding							10			10
3. Quality and availability of habitat required for mobility							11			8
4. Absence of threats							9			9
Species Habitat Attributes [{Ornamental Snake}]:							60			72
SH Score							6			7.2

Table B-2: AU 4 [11.3.3a (HVR)]

Assessment Type:	Assessment Site No.:	IMPACT					
		HQP 13a			HQP 14a		
Polygon No. (Figure 20044_HQAIS_04_D)		H					
Polygon area (ha)		6.75					
Total Assessment Unit Area (ha):		6.75					
Regional Ecosystem:	11.4.3a*	11.3.3a (HVR)					
BVG1M:	25a	21b					
Ecological Condition Indicator	Benchmark	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score
1. Recruitment of woody perennial species (%)	100	100	100.00%	5	100	100.00%	5
2. Native plant species richness (No.):							
- Trees	1	2	200.00%	5	2.00	200.00%	5
- Shrubs	2	3	150.00%	5	2	100.00%	5
- Grasses	4	9	225.00%	5	3	75.00%	2.5
- Forbs	4	29	725.00%	5	15	375.00%	5
3. Tree canopy height (m):							
- Canopy Layer	10	8.90	89.00%	5	8.40	84.00%	5
- Sub-Canopy Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				5			5
4. Tree canopy cover (%):							
- Canopy Layer	90	33.98	37.76%	2	50.35	55.94%	5
- Sub-Canopy Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				2			5
5. Shrub canopy cover (%):	13	21.60	166.15%	5	12.40	95.38%	5
6. Native perennial grass cover (%):	14	0.60	4.29%	0	0.20	1.43%	0
7. Organic litter (%):	65	31.00	47.69%	3	6.80	10.46%	3
8. Large trees/ha [combined: euc & non-euc]							
- euc (n/a)	n/a	n/a	n/a		n/a	n/a	
- non-euc (12> cm)	680	490			520		
Total Large Trees	680	490	72.06%	10	520	76.47%	10
9. Coarse woody debris (m/ha):	688	0	0.00%	0	720	104.65%	5
10. Non-native plant cover (%):	0	0.10	0.10%	10	0.00	0.00%	10
Site Condition Score				60			65.5
1. Size of patch (Fragmented) [ha]	n/a	7	-	2	7	-	2
2. Connectedness (Fragmented) [%]	n/a	0	-	0	0	-	0
3. Context (Fragmented) [%]	n/a	13	-	2	13	-	2
Site Context Score:				4			4
1. Quality & availability of food and habitat for foraging				45			45
2. Quality & availability of habitat required for shelter and breeding				10			10
3. Quality and availability of habitat required for mobility				8			8
4. Absence of threats				9			9
Species Habitat Attributes [{Ornamental Snake}]:				72			72
SH Score			7.2			7.2	

* This benchmark has been used in the absence of a one for 11.3.3a.

Table B3: AU 7 [11.4.9a (HVR)]

Assessment Type:		IMPACT								
Assessment Site No.:		HQP 5a		HQP 9a		HQP 10a				
Polygon No. (Figure 20044_HQAIS_04_D)		0.72		7.65		2.26				
Polygon area (ha)		B		P		Q				
Total Assessment Unit Area (ha):		10.63								
Regional Ecosystem:	11.4.9	11.4.9a (HVR)								
BVG1M:	25a	25a								
Ecological Condition Indicator	Benchmark									
1. Recruitment of woody perennial species (%)	100	0	0.00%	0	0	0.00%	0	0	0.00%	0
2. Native plant species richness (No.):										
- Trees	5	1	20.00%	0	1	20.00%	0	1	20.00%	0
- Shrubs	10	4	40.00%	2.5	4	40.00%	2.5	4	40.00%	2.5
- Grasses	5	2	40.00%	2.5	2	40.00%	2.5	2	40.00%	2.5
- Forbs	10	9	90.00%	5	9	90.00%	5	9	90.00%	5
3. Tree canopy height (m):										
- Canopy Layer	13	10.30	79.23%	5	10.30	79.23%	5	10.30	79.23%	5
- Sub-Canopy Layer	8	4.90	61.25%	3	4.90	61.25%	3	4.90	61.25%	3
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				4			4			4
4. Tree canopy cover (%):										
- Canopy Layer	25	53.85	215.40%	5	53.85	215.40%	5	53.85	215.40%	5
- Sub-Canopy Layer	10	6.90	69.00%	5	6.90	69.00%	5	6.90	69.00%	5
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				5			5			5
5. Shrub canopy cover (%):	5	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%	0
6. Native perennial grass cover (%):	20	0.00	0.00%	0	0.00	0.00%	0	0.00	0.00%	0
7. Organic litter (%):	45	31.50	70.00%	5	31.50	70.00%	5	31.50	70.00%	5
8. Large trees/ha [combined: euc & non-euc]										
- euc (> cm)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
- non-euc (>28 cm)	45	20		20			20			
Total Large Trees	45	20	44.44%	5	20	44.44%	5	20	44.44%	5
9. Coarse woody debris (m/ha):	1200	510	42.50%	2	510	42.50%	2	510	42.50%	2
10. Non-native plant cover (%):	0	73.90	73.90%	0	73.90	73.90%	0	73.90	73.90%	0
Site Condition Score				31			31			31
1. Size of patch (Fragmented) [ha]	n/a	1	-	0	8	-	2	-	0	0
2. Connectedness (Fragmented) [%]	n/a	0	-	0	0	-	0	-	0	0
3. Context (Fragmented) [%]	n/a	0	-	0	0	-	0	8	-	0
Site Context Score:				0			2			0
1. Quality & availability of food and habitat for foraging							45			
2. Quality & availability of habitat required for shelter and breed							10			
3. Quality and availability of habitat required for mobility							9			
4. Absence of threats							9			
Species Habitat Attributes [{Ornamental Snake}]:							73			
SH Score (ORNAMENTAL SNAKE)							7.3			

Table B4: AU 11 [11.4.9a (n-r)]

Assessment Type:		IMPACT		
Assessment Site No.:		HQP (tbp)		
Polygon No. (Figure 20044_HQ AIS_04_D)		U		
Polygon area (ha)		33.91		
Total Assessment Unit Area (ha):		33.91		
Regional Ecosystem:	11.4.9	Gilgai (n-r 11.4.9a)		
BVG1M:	25a	25a		
Ecological Condition Indicator	Benchmark			
1. Recruitment of woody perennial species (%)	100	100	100.00%	5
2. Native plant species richness (No.):				
- Trees	5	0	0.00%	0
- Shrubs	10	1	10.00%	0
- Grasses	5	2	40.00%	2.5
- Forbs	10	4	40.00%	2.5
3. Tree canopy height (m):				
- Canopy Layer	13	0.00	0.00%	0
- Sub-Canopy Layer	8	0.00	0.00%	0
- Emergent Layer	n/a	n/a	n/a	n/a
Average Score				0
4. Tree canopy cover (%):				
- Canopy Layer	25	0.00	0.00%	0
- Sub-Canopy Layer	10	0.00	0.00%	0
- Emergent Layer	n/a	n/a	n/a	n/a
Average Score				0
5. Shrub canopy cover (%):	5	0.10	2.00%	0
6. Native perennial grass cover (%):	20	1.00	5.00%	0
7. Organic litter (%):	45	15.00	33.33%	3
8. Large trees/ha [combined: euc & non-euc]				
- euc (> cm)	n/a	n/a	n/a	
- non-euc (>28 cm)	45	0		
Total Large Trees	45	0	0.00%	0
9. Coarse woody debris (m/ha):	1200	0	0.00%	0
10. Non-native plant cover (%):	0	25.00	25.00%	5
Site Condition Score		18		
1. Size of patch (Fragmented) [ha]	n/a	34	-	5
2. Connectedness (Fragmented) [%]	n/a	0	-	0
3. Context (Fragmented) [%]	n/a	0	-	0
Site Context Score:		5		
1. Quality & availability of food and habitat for foraging				21
2. Quality & availability of habitat required for shelter and breed				8
3. Quality and availability of habitat required for mobility				11
4. Absence of threats				4
Species Habitat Attributes [{Ornamental Snake}]:		44		
SH Score (ORNAMENTAL SNAKE)		4.4		

Appendix C

Xerothamnella herbacea

Offset assessment guide

Offsets Assessment Guide

For use in determining offsets under the Environment Protection and Biodiversity Conservation Act 1999
2 October 2012
This guide relies on Macros being enabled in your browser.

Matter of National Environmental Significance	
Name	Xerothermella herbaea
EPBC Act status	Endangered
Annual probability of extinction Based on IUCN category definitions	1.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			
			Quality	0		
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	No		Area			
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species</i>						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact	Units	Information source	
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	Yes	90 individuals of X. herbaea occur across 10 locations within the project	90	Count	The information used to assess the impact area is based on seasonal field surveys of the proposed	

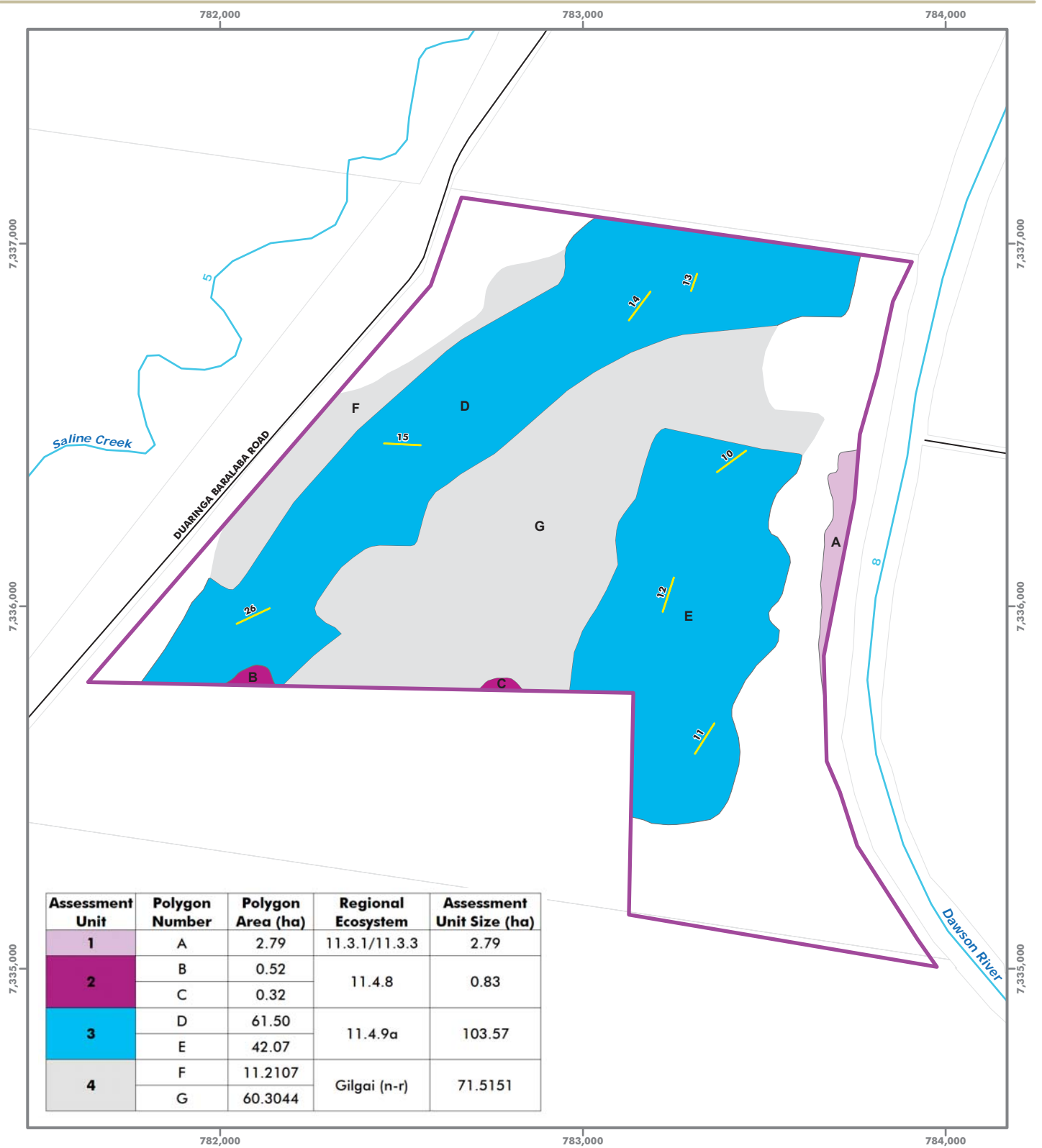
Offset calculator																	
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
<i>Ecological Communities</i>																	
Area of community	Yes		Adjusted hectares		Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset	0.00	0.00	0.00	0.00	#DIV/0!	#DIV/0!			
					Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0									
					Time until ecological benefit	Start quality (scale of 0-10)	Future quality without offset (scale of 0-10)	Future quality with offset (scale of 0-10)	0.00	0.00	0.00						
<i>Threatened species habitat</i>																	
Area of habitat	Yes		Adjusted hectares		Time over which loss is averted (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset	0.00	0.00	0.00	0.00	#DIV/0!	#DIV/0!			
					Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0									
					Time until ecological benefit	Start quality (scale of 0-10)	Future quality without offset (scale of 0-10)	Future quality with offset (scale of 0-10)	0.00	0.00	0.00						
<i>Threatened species</i>																	
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start value	Future value without offset	Future value with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source	
Number of features e.g. Nest hollows, habitat trees	No																
Condition of habitat Change in habitat condition, but no change in extent	No																
Birth rate e.g. Change in nest success	No																
Mortality rate e.g. Change in number of road kills per year	No																
Number of individuals e.g. Individual plants/animals	Yes	90	Count	Field surveys estimate over 2,000 individuals being present within Property F	20	2,000	500	3000	2500	95%	2375.00	1870.91	2078.79%	Yes			

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	90	1870.91	2078.79%	Yes	\$0.00	N/A	\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	0	0.00	#DIV/0!	#DIV/0!	\$0.00	#DIV/0!	#DIV/0!
Area of community	0	0.00	#DIV/0!	#DIV/0!	\$0.00	#DIV/0!	#DIV/0!
					\$0.00	#DIV/0!	#DIV/0!

Appendix D

Ornamental Snake

Offset assessment guide and habitat quality scoring raw data



Legend

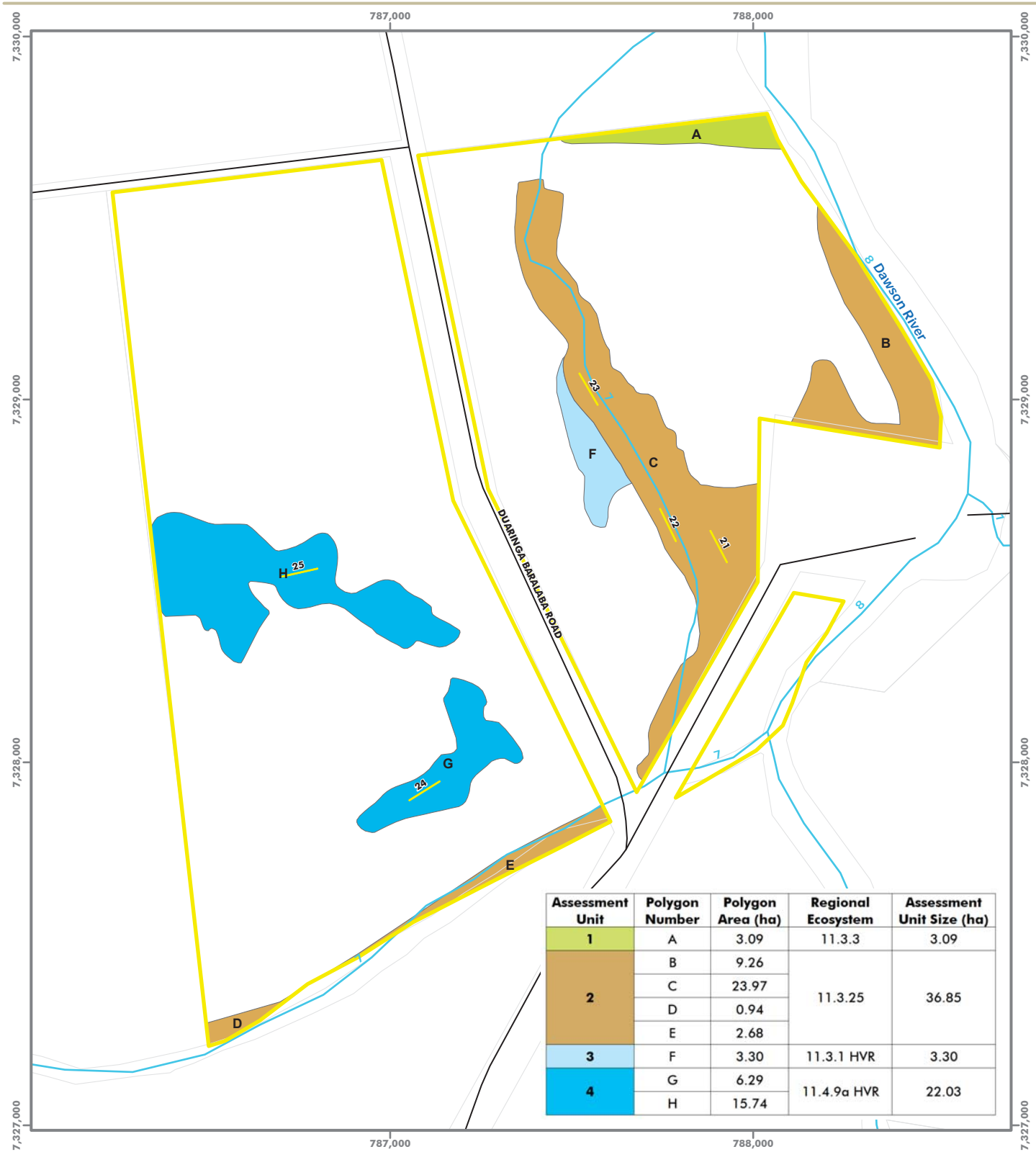
- Property A
- Road
- Vegetation Management Act watercourse
- Cadastral boundary
- Habitat quality plot
- D Polygon number

Figure D1 : Property A assessment units

Baralaba South Project
Habitat Quality Assessment Offset Sites

Map Number: 20044_BOS3_E1_A
Date: 03 November 2023
Map Projection: GDA2020 MGA Zone 55
Data: Roads, Watercourse, DCDB - (c)DNRM 2023





Legend

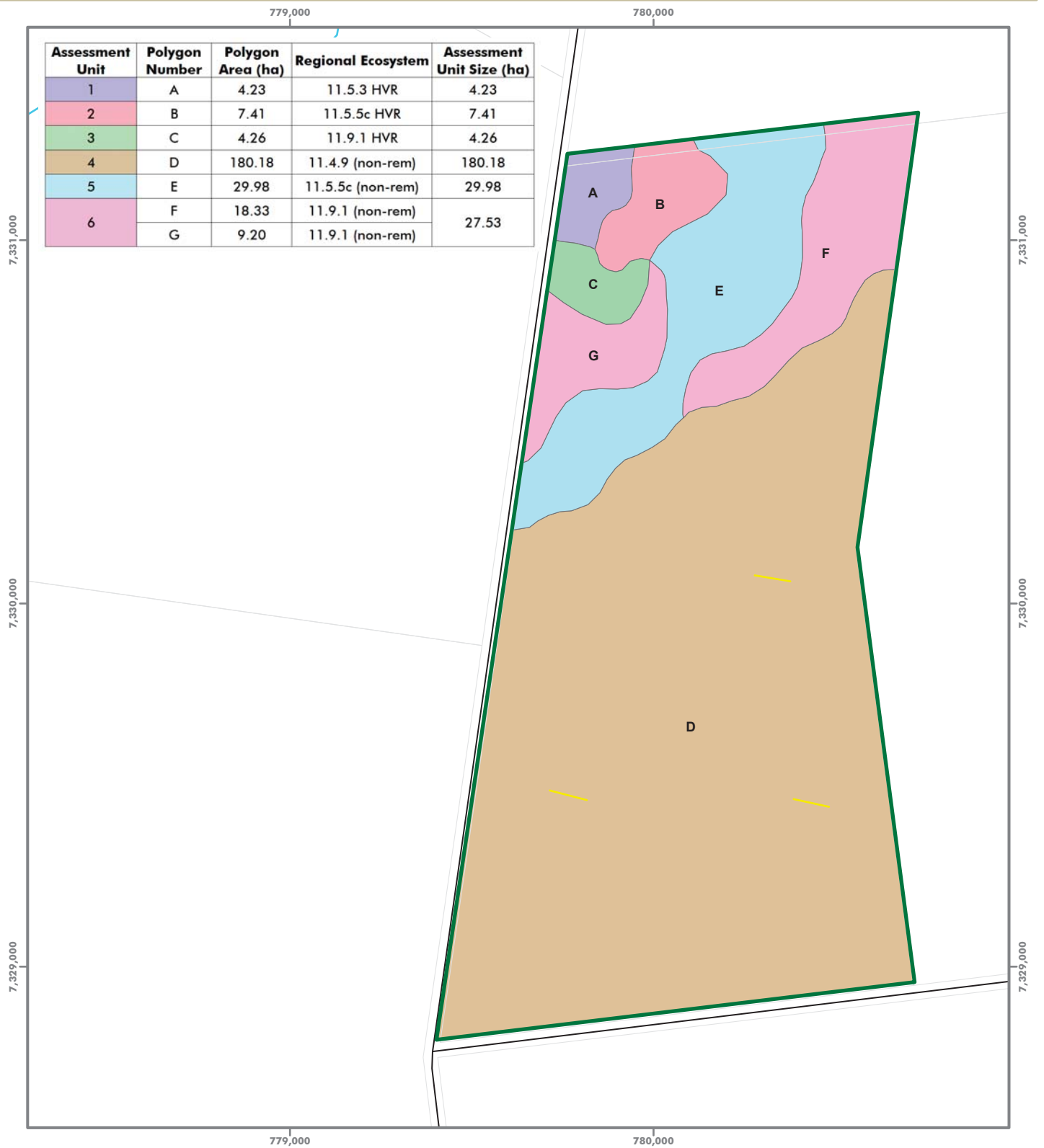
- Property B
- Road
- Vegetation Management Act watercourse
- Cadastral boundary
- Habitat quality plot
- D Polygon number

Figure D2 : Property B assessment units

Baralaba South Project
Habitat Quality Assessment Offset Sites

Map Number: 20044_BOS3_E2_A
Date: 03 November 2023
Map Projection: GDA2020 MGA Zone 55
Data: Roads, Watercourse, DCDB - (c)DNRM 2023





Legend

- Lot 2 on RP814083
- Road
- Vegetation Management Act watercourse
- Cadastral boundary
- Habitat quality plot
- D Polygon number

Figure D3 : Property E assessment units

Baralaba South Project
Habitat Quality Assessment Offset Sites

Map Number: 20044_BOS3_E3_A
Date: 03 November 2023
Map Projection: GDA2020 MGA Zone 55
Data: Roads, Watercourse, DCDB - (c)DNRM 2023



Table E-5a: AU 3 [11.4.9a (HVR)]

Assessment Type:		Offset								
LOT on PLAN		Property A								
Assessment Site No.:		HQP 10a			HQP 11a			HQP 12a		
Polygon No. (Figure 20044_HQAOS_03_C)		E								
Polygon area (ha)		42.07								
Total Assessment Unit Area (ha):		103.57 (See table E-5b)								
Regional Ecosystem:		11.4.9a (HVR)								
BVG1M:		25a								
Ecological Condition Indicator	Benchmark	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score
1. Recruitment of woody perennial species (%)	100	100	100.00%	5	100	100.00%	5	100	100.00%	5
2. Native plant species richness (No.):										
- Trees	5	2	40.00%	2.5	3	60.00%	2.5	2	40.00%	2.5
- Shrubs	10	3	30.00%	2.5	7	70.00%	2.5	6	60.00%	2.5
- Grasses	5	6	120.00%	5	5	100.00%	5	5	100.00%	5
- Forbs	10	15	150.00%	5	18	180.00%	5	10	100.00%	5
3. Tree canopy height (m):										
- Canopy Layer	13	9.00	69.23%	3	6.00	46.15%	3	6.90	53.08%	3
- Sub-Canopy Layer	8.0	4.60	57.50%	3	4.20	52.50%	3	3.80	47.50%	3
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				3			3			3
4. Tree canopy cover (%):										
- Canopy Layer	25	2.00	8.00%	0	32.80	131.20%	5	28.30	113.20%	5
- Sub-Canopy Layer	10	42.90	429.00%	5	6.90	69.00%	5	22.55	225.50%	5
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				2.5			5			5
5. Shrub canopy cover (%):	5	1.85	37.00%	3	1.70	34.00%	3	6.50	130.00%	5
6. Native perennial grass cover (%):	20	1.40	7.00%	0	0.30	1.50%	0	2.00	10.00%	7
7. Organic litter (%):	45	45.20	100.44%	5	37.40	83.11%	5	45.00	100.00%	5
8. Large trees/ha [combined: euc & non-euc]										
- euc (> cm)	n/a	n/a			n/a			n/a		
- non-euc (>28 cm)	45	0			1		5	0		0
Total Large Trees	45	0	0.00%	0	1	2.22%	5	0	0.00%	0
9. Coarse woody debris (m/ha):	1200	153	12.71%	2	125	10.42%	2	100	8.33%	0
10. Non-native plant cover (%):	0	59.70	59.70%	0	62.50	62.50%	0	39.80	39.80%	3
Site Condition Score				33			40.5			39.5
1. Size of patch (Fragmented) [ha]	n/a	42	-	5	42	-	5	42	-	5
2. Connectedness (Fragmented) [%]	n/a	0	-	0	0	-	0	0	-	0
3. Context (Fragmented) [%]	n/a	18	-	2	18	-	2	18	-	2
Site Context Score:				7			7			7
1. Quality & availability of food and habitat for foraging				50			50			50
2. Quality & availability of habitat required for shelter and breeding				8			8			8
3. Quality and availability of habitat required for mobility				15			15			13
4. Absence of threats				9			9			9
Species Habitat Attributes [(Ornamental Snake)]:				82			82			80
SH Score (ORNAMENTAL SNAKE)			8.2			8.2			8	

Table E-6: AU 4 [11.4.9a (HVR)]

Assessment Type:		Offset					
LOT on PLAN		Property B					
Assessment Site No.:		HQP 24a			HQP 25a		
Polygon No. (Figure 20044_BOS_E2_B)		G			H		
Polygon area (ha)		6.29			15.74		
Total Assessment Unit Area (ha):		22.03					
Regional Ecosystem:		11.4.9a (HVR)					
BVG1M:		25a			25a		
Ecological Condition Indicator	Benchmark	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score
1. Recruitment of woody perennial species (%)	100	100	100.00%	5	100	100.00%	5
2. Native plant species richness (No.):							
- Trees	5	1	20.00%	0	1	20.00%	0
- Shrubs	10	5	50.00%	2.5	5	50.00%	2.5
- Grasses	5	2	40.00%	2.5	4	80.00%	2.5
- Forbs	10	19	190.00%	5	16	160.00%	5
3. Tree canopy height (m):							
- Canopy Layer	13	11.00	84.62%	5	10.40	80.00%	5
- Sub-Canopy Layer	8.0	7.60	95.00%	5	7.80	97.50%	5
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				5			5
4. Tree canopy cover (%):							
- Canopy Layer	25	75.15	300.60%	5	53.70	214.80%	5
- Sub-Canopy Layer	10	6.55	65.50%	5	22.50	225.00%	5
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				5			5
5. Shrub canopy cover (%):	5	1.60	32.00%	3	2.40	48.00%	3
6. Native perennial grass cover (%):	20	5.30	26.50%	1	10.00	50.00%	3
7. Organic litter (%):	45	49.40	109.78%	5	57.80	128.44%	5
8. Large trees/ha [combined: euc & non-euc]							
- euc (> 28 cm)	n/a	n/a			n/a		
- non-euc (> 28 cm)	45	20			10		
Total Large Trees	45	20	44.44%	5	10	22.22%	5
9. Coarse woody debris (m/ha):	1200	110	9.17%	0	285	23.75%	2
10. Non-native plant cover (%):	0	45.60	45.60%	3	34.60	34.60%	3
Site Condition Score				42	46		
1. Size of patch (Fragmented) [ha]	n/a	6	-	2	16	-	2
2. Connectedness (Fragmented) [%]	n/a	0	-	0	0	-	0
3. Context (Fragmented) [%]	n/a	13	-	2	9	-	0
Site Context Score:				4	2		
1. Quality & availability of food and habitat for foraging				50	50		
2. Quality & availability of habitat required for shelter and breeding				13	13		
3. Quality and availability of habitat required for mobility				13	13		
4. Absence of threats				9	9		
Species Habitat Attributes [(Ornamental Snake)]:				85	85		
SH Score (ORNAMENTAL SNAKE)				8.5	8.5		

Table E-1: AU 1 [11.3.1]

Assessment Type:		Property D		
LOT ON PLAN		HQP 31a		
Assessment Site No.:		E		
Polygon No. (Figure 20044_BOS_C2_B)		78.66		
Polygon area (ha)		78.66		
Total Assessment Unit Area (ha):		11.3.1		
Regional Ecosystem:		25a		
BVG1M:		25a		
Ecological Condition Indicator	Benchmark	Field value	% of	Score
1. Recruitment of woody perennial species (%)	100	100	100.00%	5
2. Native plant species richness (No.):				
- Trees	3	4	133.33%	5
- Shrubs	5	2	40.00%	2.5
- Grasses	4	10	250.00%	5
- Forbs	8	22	275.00%	5
3. Tree canopy height (m):				
- Canopy Layer	14	9.50	67.86%	3
- Sub-Canopy Layer	4	5.30	132.50%	5
- Emergent Layer	n/a	n/a	n/a	n/a
Average Score				4
4. Tree canopy cover (%):				
- Canopy Layer	29	18.15	62.59%	5
- Sub-Canopy Layer	9	33.05	367.22%	5
- Emergent Layer	n/a	n/a	n/a	n/a
Average Score				5
5. Shrub canopy cover (%):	8	7.50	93.75%	5
6. Native perennial grass cover (%):	8	3.10	38.75%	1
7. Organic litter (%):	34	42.30	124.41%	5
8. Large trees/ha [combined: euc & non-euc]				
- euc (> 28 cm)	n/a	n/a	n/a	
- non-euc (>28 cm)	170.0	5		
Total Large Trees	170	5	2.94%	5
9. Coarse woody debris (m/ha):	1752	115	6.56%	0
10. Non-native plant cover (%):	0	9.30	9.30%	5
Site Condition Score				52.5
1. Size of patch (Fragmented) [ha]	n/a	1491	-	10
2. Connectedness (Fragmented) [%]	n/a	70	-	4
3. Context (Fragmented) [%]	n/a	45	-	4
Site Context Score:				18
1. Quality & availability of food and habitat for foraging				
2. Quality & availability of habitat required for shelter and breeding				
3. Quality and availability of habitat required for mobility				
4. Absence of threats				
Species Habitat Attributes [(Ornamental Snake)]:				69
SH Score				6.9

Table E-3: AU 2 (11.3.25)

Assessment Type:		Offsets		
LOT ON PLAN		Property D		
Assessment Site No.:		HQP 32a		
Polygon No. (Figure 20044_BOS_C2_B)		B		
Polygon area (ha)		35.45		
Total Assessment Unit Area (ha):		35.45		
Regional Ecosystem:		11.3.25		
BVG1M:		16a		
Ecological Condition Indicator	Benchmark	Field value	% of	Score
1. Recruitment of woody perennial species (%)	100	50	50.00%	3
2. Native plant species richness (No.):				
- Trees	4	5	125.00%	5
- Shrubs	2	9	450.00%	5
- Grasses	8	7	87.50%	2.5
- Forbs	12	23	191.67%	5
3. Tree canopy height (m):				
- Canopy Layer	23	27.30	118.70%	5
- Sub-Canopy Layer	n/a	17.80	n/a	n/a
- Emergent Layer	n/a		n/a	n/a
Average Score				5
4. Tree canopy cover (%):				
- Canopy Layer	22	43.00	195.45%	5
- Sub-Canopy Layer	n/a	30.35	n/a	n/a
- Emergent Layer	n/a		n/a	n/a
Average Score				5
5. Shrub canopy cover (%):	1	0.95	95.00%	5
6. Native perennial grass cover (%):	12	0.90	7.50%	0
7. Organic litter (%):	15	64.90	432.67%	3
8. Large trees/ha [combined: euc & non-euc]				
- euc (>49 cm)	14	24		
- non-euc (>29 cm)	7	14	n/a	
Total Large Trees	14	38	271.43%	15
9. Coarse woody debris (m/ha):	375	775.00	206.67%	2
10. Non-native plant cover (%):	0	41.50	41.50%	3
Site Condition Score				58.5
1. Size of patch (Fragmented) [ha]	n/a	1491	-	10
2. Connectedness (Fragmented) [%]	n/a	37	-	2
3. Context (Fragmented) [%]	n/a	12	-	2
Site Context Score:				14
1. Quality & availability of food and habitat for foraging				20
2. Quality & availability of habitat required for shelter and breeding				5
3. Quality and availability of habitat required for mobility				7
4. Absence of threats				9
Species Habitat Attributes [(Ornamental Snake)]:				41
SH Score				4.1

Table E-5b: AU 3 [11.4.9a (HVR)]

Assessment Type:		Offsets											
LOT on PLAN		Property D											
Assessment Site No.:		HQP 13a			HQP 14a			HQP 15a			HQP 26a		
Polygon No. (Figure 20044_BOS_E1_B)		D											
Polygon area (ha)		61.5											
Total Assessment Unit Area (ha):		103.57 (See table E-5a)											
Regional Ecosystem:		11.4.9a (HVR)											
BVG1M:		25a											
Ecological Condition Indicator	Benchmark	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score	Field value	% of Benchmark	Score
1. Recruitment of woody perennial species (%)	100	100	100.00%	5	100	100.00%	5	100	100.00%	5	100	100.00%	5
2. Native plant species richness (No.):													
- Trees	5	2	40.00%	2.5	3	60.00%	2.5	3	60.00%	2.5	2	40.00%	2.5
- Shrubs	10	2	20.00%	0	8	80.00%	2.5	7	70.00%	2.5	7	70.00%	2.5
- Grasses	5	5	100.00%	5	3	60.00%	2.5	3	60.00%	2.5	2	40.00%	2.5
- Forbs	10	8	80.00%	2.5	4	40.00%	2.5	9	90.00%	5	11	110.00%	5
3. Tree canopy height (m):													
- Canopy Layer	13	0.00	0.00%	0	6.50	50.00%	3	7.80	60.00%	3	7.70	59.23%	3
- Sub-Canopy Layer	8.0	5.20	65.00%	3	3.20	40.00%	3	4.10	51.25%	3	4.20	52.50%	3
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				1.5			3			3			3
4. Tree canopy cover (%):													
- Canopy Layer	25	0.00	0.00%	0	18.45	73.80%	5	17.40	69.60%	5	47.33	189.32%	5
- Sub-Canopy Layer	10	38.75	387.50%	5	18.20	182.00%	5	11.15	111.50%	5	5.05	50.50%	5
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				2.5			5			5			5
5. Shrub canopy cover (%):	5	4.75	95.00%	5	2.20	44.00%	3	3.35	67.00%	5	4.65	93.00%	5
6. Native perennial grass cover (%):	20	0.00	0.00%	0	0.30	1.50%	0	0.20	1.00%	0	0.00	0.00%	0
7. Organic litter (%):	45	58.20	129.33%	5	23.80	52.89%	5	20.70	46.00%	3	54.00	120.00%	5
8. Large trees/ha [combined: euc & non-euc]													
- euc (> 28 cm)	n/a	n/a			n/a			n/a			n/a		
- non-euc (>28 cm)	45	0			0			0			0		
Total Large Trees	45	0	0.00%	0	0	0.00%	0	0	0.00%	0	0	0.00%	0
9. Coarse woody debris (m/ha):	1200	520	43.33%	2	240	20.00%	2	310	25.83%	2	25	2.08%	0
10. Non-native plant cover (%):	0	10.50	10.50%	5	70.60	70.60%	0	57.80	57.80%	0	63.10	63.10%	0
Site Condition Score				33.5			30.5			35.5			35.5
1. Size of patch (Fragmented) [ha]	n/a	61	-	5	61	-	5	61	-	5	61	-	5
2. Connectedness (Fragmented) [%]	n/a	4	-	0	4	-	0	4	-	0	4	-	0
3. Context (Fragmented) [%]	n/a	16	-	2	16	-	2	16	-	2	16	-	2
Site Context Score:				7			7			7			7
1. Quality & availability of food and habitat for foraging				40			50			50			50
2. Quality & availability of habitat required for shelter and breeding				6			8			8			13
3. Quality and availability of habitat required for mobility				9			13			13			13
4. Absence of threats				9			9			9			9
Species Habitat Attributes [(Ornamental Snake)]:				64			80			80			85
SH Score (ORNAMENTAL SNAKE)				6.4			8			8			8.5

Table E-7: AU 4 [11.4.9a (n-r)]

Assessment Type:		Offsets								
LOT on PLAN		Property E								
Assessment Site No.:		HQP 36a			HQP 37a			HQP 38a		
Polygon No. (Figure 20044_BOS_E3_B)		D								
Polygon area (ha)		180.18								
Total Assessment Unit Area (ha):		180.18								
Regional Ecosystem:		11.4.9a								
BVG1M:		25a								
Ecological Condition Indicator	Benchmark	Field value	% of	Score	Field value	% of	Score	Field value	% of	Score
1. Recruitment of woody perennial species (%)	100	100	100.00%	5	100	100.00%	5	100	100.00%	5
2. Native plant species richness (No.):										
- Trees	5	2	40.00%	2.5	3	60.00%	2.5	3	60.00%	2.5
- Shrubs	10	2	20.00%	0	4	40.00%	2.5	3	30.00%	2.5
- Grasses	5	7	140.00%	5	5	100.00%	5	7	140.00%	5
- Forbs	10	28	280.00%	5	25	250.00%	5	14	140.00%	5
3. Tree canopy height (m):										
- Canopy Layer	13	8.50	65.38%	3	7.00	53.85%	3	8.70	66.92%	3
- Sub-Canopy Layer	8.0	0.00	0.00%	0	3.40	42.50%	3	4.60	57.50%	3
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				1.5			3			3
4. Tree canopy cover (%):										
- Canopy Layer	25	20.90	83.60%	5	19.15	76.60%	5	15.00	60.00%	5
- Sub-Canopy Layer	10	0.00	0.00%	0	2.30	23.00%	2	3.55	35.50%	2
- Emergent Layer	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Average Score				2.5			3.5			3.5
5. Shrub canopy cover (%):	5	0.00	0.00%	0	0.00	0.00%	0	1.60	32.00%	3
6. Native perennial grass cover (%):	20	11.00	55.00%	3	1.50	7.50%	0	1.00	5.00%	0
7. Organic litter (%):	45	23.40	52.00%	5	12.40	27.56%	3	14.10	31.33%	3
8. Large trees/ha [combined: euc & non-euc]										
- euc (> 28 cm)	n/a	n/a			n/a			n/a		
- non-euc (>28 cm)	45	0			0			0		
Total Large Trees	45	0	0.00%	0	0	0.00%	0	0	0.00%	0
9. Coarse woody debris (m/ha):	1200	2	0.17%	0	2	0.17%	0	235	19.58%	2
10. Non-native plant cover (%):	0	58.30	58.30%	0	91.00	91.00%	0	88.60	88.60%	0
Site Condition Score				27			27			32
1. Size of patch (Fragmented) [ha]	n/a	0	-	0	0	-	0	0	-	0
2. Connectedness (Fragmented) [%]	n/a	0	-	0	0	-	0	0	-	0
3. Context (Fragmented) [%]	n/a	2	-	0	2	-	0	2	-	0
Site Context Score:				0			0			0
1. Quality & availability of food and habitat for foraging				47			47			47
2. Quality & availability of habitat required for shelter and breeding				13			13			13
3. Quality and availability of habitat required for mobility				15			15			15
4. Absence of threats				9			9			9
Species Habitat Attributes [(Ornamental Snake)]:				84			84			84
SH Score (ORNAMENTAL SNAKE)			8.4			8.4			8.4	

Table E-2: AU 1 [11.3.1 (n-r) PMAV]

Assessment Type:		Offsets		
LOT ON PLAN		Property F		
Assessment Site No.:		HQP 8		
Polygon No. (Figure withheld)		A, B, C		
Polygon area (ha)		6.74		
Total Assessment Unit Area (ha):		6.74		
Regional Ecosystem:		11.3.1 (n-r) [PMAV]		
BVG1M:		25a		
Ecological Condition Indicator	Benchmark	Field value	% of Benchmark	Score
1. Recruitment of woody perennial species (%)	100	100.00	100.00%	5
2. Native plant species richness (No.):				
- Trees	3	12.00	400.00%	5
- Shrubs	5	119.00	2380.00%	5
- Grasses	4	7.00	175.00%	5
- Forbs	8	14.00	175.00%	5
3. Tree canopy height (m):				
- Canopy Layer	14	15.60	111.43%	5
- Sub-Canopy Layer	4	8.70	217.50%	5
- Emergent Layer	n/a		n/a	n/a
Average Score				5
4. Tree canopy cover (%):				
- Canopy Layer	29	44.35	152.93%	5
- Sub-Canopy Layer	9.0	32.50	361.11%	5
- Emergent Layer	n/a		n/a	n/a
Average Score				5
5. Shrub canopy cover (%):	8	8.50	106.25%	5
6. Native perennial grass cover (%):	8	0.40	5.00%	0
7. Organic litter (%):	34	68.70	202.06%	3
8. Large trees/ha [combined: euc & non-euc]				
- euc (> 29 cm)	n/a		n/a	
- non-euc (>29 cm)	170.0	30.00		
Total Large Trees	170	30.00	17.65%	5
9. Coarse woody debris (m/ha):	1752	565.00	32.25%	2
10. Non-native plant cover (%):	0	4.00	4.00%	10
Site Condition Score				60
1. Size of patch (Fragmented) [ha]	n/a	15	-	2
2. Connectedness (Fragmented) [%]	n/a	33	-	2
3. Context (Fragmented) [%]	n/a	3	-	0
Site Context Score:				4
1. Quality & availability of food and habitat for foraging				35
2. Quality & availability of habitat required for shelter and breeding				10
3. Quality and availability of habitat required for mobility				11
4. Absence of threats				9
Species Habitat Attributes [(Ornamental Snake)]:				65
SH Score		6.5		

Table E-4: AU 2 [11.3.1 (n-r) PMAV]

Assessment Type:		Offsets		
LOT ON PLAN		Property F		
Assessment Site No.:		HOP 8		
Polygon No. (Figure withheld)		D		
Polygon area (ha)		8.18		
Total Assessment Unit Area (ha):		8.18		
Regional Ecosystem:		11.3.25 (n-r) [PMAV]		
BVG1M:		16a		
Ecological Condition Indicator	Benchmark	Field value	% of	Score
1. Recruitment of woody perennial species (%)	100	50	50.00%	3
2. Native plant species richness (No.):				
- Trees	4	8	200.00%	5
- Shrubs	2	8	400.00%	5
- Grasses	8	2	25.00%	2.5
- Forbs	12	13	108.33%	5
3. Tree canopy height (m):				
- Canopy Layer	23	22.40	97.39%	5
- Sub-Canopy Layer	n/a		n/a	n/a
- Emergent Layer	n/a		n/a	n/a
Average Score				5
4. Tree canopy cover (%):				
- Canopy Layer	22	30.15	137.05%	5
- Sub-Canopy Layer	n/a		n/a	n/a
- Emergent Layer	n/a		n/a	n/a
Average Score				5
5. Shrub canopy cover (%):	1	3.15	315.00%	3
6. Native perennial grass cover (%):	12	0.20	1.67%	0
7. Organic litter (%):	15	23.30	155.33%	5
8. Large trees/ha [combined: euc & non-euc]				
- euc (>49 cm)	14	22		
- non-euc (>29 cm)	7	20	n/a	
Total Large Trees	14	42	300.00%	15
9. Coarse woody debris (m/ha):	375	550.00	146.67%	5
10. Non-native plant cover (%):	0	57.70	57.70%	0
Site Condition Score				58.5
1. Size of patch (Fragmented) [ha]	n/a	15	-	2
2. Connectedness (Fragmented) [%]	n/a	23	-	2
3. Context (Fragmented) [%]	n/a	1	-	0
Site Context Score:				4
1. Quality & availability of food and habitat for foraging				35
2. Quality & availability of habitat required for shelter and breeding				6
3. Quality and availability of habitat required for mobility				9
4. Absence of threats				9
Species Habitat Attributes [(Ornamental Snake)]:				59
SH Score				5.9

Offsets Assessment Guide

For use in determining offsets under the *Environment Protection and Biodiversity Conservation Act 1999*
2 October 2012

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Matter of National Environmental Significance	
Name	Ornamental Snake
EPBC Act status	Vulnerable
Annual probability of extinction <small>Based on IUCN category definitions</small>	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	Yes	The project disturbance footprint encompasses foraging and shelter habitat for this species in the form of gilgai on cracking clay soils and a small wetland community. The majority of habitat (i.e. 68.32	Area	34.9	Hectares	The information used to assess the impact area is based on seasonal field surveys of the proposed Baralaba South project area by Ecological Survey & Management (2021), literature review and particularly the information contained within the DAWE SPRAT profile
			Quality	5	Scale 0-10	
			Total quantum of impact	17.45	Adjusted hectares	
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact	Units	Information source	
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
<i>Threatened species</i>						
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator																												
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source												
<i>Ecological Communities</i>																												
Area of community	No				Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset																				
					Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0																				
					Time until ecological benefit	Start quality (scale of 0-10)	Future quality without offset (scale of 0-10)	Future quality with offset (scale of 0-10)																				
<i>Threatened species habitat</i>																												
Area of habitat	Yes	17.45	Adjusted hectares	175.51	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	175.51	Risk of loss (%) without offset	90%	Risk of loss (%) with offset	5%	Raw gain	149.18	Confidence in result (%)	95%	Adjusted gain	141.72	Net present value (adjusted hectares)	136.17	% of impact offset	85.01	Minimum (90%) direct offset requirement met?	Yes	Cost (\$ total)		Information source	
					Future area without offset (adjusted hectares)	17.6	Future area with offset (adjusted hectares)	166.7																				
					Time until ecological benefit	5	Start quality (scale of 0-10)	4	Future quality without offset (scale of 0-10)	4	Future quality with offset (scale of 0-10)	6	Raw gain	2.00	Confidence in result (%)	95%	Adjusted gain	1.90	Net present value (adjusted hectares)	1.88								
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start value	Future value without offset	Future value with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source												
Number of features e.g. Nest hollows, habitat trees	No																											
Condition of habitat Change in habitat condition, but no change in extent	No																											
<i>Threatened species</i>																												
Birth rate e.g. Change in nest success	No																											
Mortality rate e.g. Change in number of road kills per year	No																											
Number of individuals e.g. Individual plants/animals	No																											

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	0				\$0.00		\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	17.45	85.01	487.14%	Yes	\$0.00	N/A	\$0.00
Area of community	0				\$0.00		\$0.00
					\$0.00	\$0.00	\$0.00

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Annual probability of extinction <small>Based on IUCN category definitions</small>	0.2%

Key to Cell Colours
User input required
Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	Yes	The project disturbance footprint encompasses foraging and shelter habitat for this species in the form of gilgai on cracking clay soils and a small wetland community. The majority of habitat (i.e. 68.32	Area	34.9	Hectares	The information used to assess the impact area is based on seasonal field surveys of the proposed Baralaba South project area by Ecological Survey & Management (2021), literature review and particularly the information contained within the DAWE SPRAT profile
			Quality	5	Scale 0-10	
			Total quantum of impact	17.45	Adjusted hectares	
<i>Threatened species</i>						
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator																													
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source													
<i>Ecological Communities</i>																													
Area of community	No				Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset																					
					Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0																					
					Time until ecological benefit	Start quality (scale of 0-10)	Future quality without offset (scale of 0-10)	Future quality with offset (scale of 0-10)																					
<i>Threatened species habitat</i>																													
Area of habitat	Yes	17.45	Adjusted hectares		Time over which loss is averted (max. 20 years)	20	Start area (hectares)	22.03	Risk of loss (%) without offset	90%	Risk of loss (%) with offset	5%	Raw gain	18.73	Confidence in result (%)	95%	Adjusted gain	17.79	Net present value	17.09	% of impact offset	73.32%	Minimum (90%) direct offset requirement met?	No	Cost (\$ total)		Information source		
					Future area without offset (adjusted hectares)	2.2	Future area with offset (adjusted hectares)	20.9																					
					Time until ecological benefit	5	Start quality (scale of 0-10)	4	Future quality without offset (scale of 0-10)	3	Future quality with offset (scale of 0-10)	7	Raw gain	4.00	Confidence in result (%)	95%	Adjusted gain	3.80	Net present value	3.76									
<i>Threatened species</i>																													
Number of features e.g. Nest hollows, habitat trees	No																												
Condition of habitat Change in habitat condition, but no change in extent	No																												
Birth rate e.g. Change in nest success	No																												
Mortality rate e.g. Change in number of road kills per year	No																												
Number of individuals e.g. Individual plants/animals	No																												

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	0				\$0.00		\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	17.45	12.79	73.32%	No	\$0.00	#DIV/0!	#DIV/0!
Area of community	0				\$0.00		\$0.00
					\$0.00	#DIV/0!	#DIV/0!

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Drop-down list
Calculated output
Not applicable to attribute

Impact calculator						
Protected matter attributes	Attribute relevant to case?	Description	Quantum of impact		Units	Information source
<i>Ecological communities</i>						
Area of community	No		Area			
			Quality			
			Total quantum of impact	0.00		
<i>Threatened species habitat</i>						
Area of habitat	Yes	The project disturbance footprint encompasses foraging and shelter habitat for this species in the form of gilgai on cracking clay soils and a small wetland community. The majority of habitat (i.e. 68.32	Area	34.9	Hectares	The information used to assess the impact area is based on seasonal field surveys of the proposed Baralaba South project area by Ecological Survey & Management (2021), literature review and particularly the information contained within the DAWE SPRAT profile
			Quality	5	Scale 0-10	
			Total quantum of impact	17.45	Adjusted hectares	
<i>Threatened species</i>						
Number of features e.g. Nest hollows, habitat trees	No					
Condition of habitat Change in habitat condition, but no change in extent	No					
Birth rate e.g. Change in nest success	No					
Mortality rate e.g. Change in number of road kills per year	No					
Number of individuals e.g. Individual plants/animals	No					

Offset calculator																												
Protected matter attributes	Attribute relevant to case?	Total quantum of impact	Units	Proposed offset	Time horizon (years)	Start area and quality	Future area and quality without offset	Future area and quality with offset	Raw gain	Confidence in result (%)	Adjusted gain	Net present value (adjusted hectares)	% of impact offset	Minimum (90%) direct offset requirement met?	Cost (\$ total)	Information source												
<i>Ecological Communities</i>																												
Area of community	No				Risk-related time horizon (max. 20 years)	Start area (hectares)	Risk of loss (%) without offset	Risk of loss (%) with offset																				
					Future area without offset (adjusted hectares)	0.0	Future area with offset (adjusted hectares)	0.0																				
					Time until ecological benefit	Start quality (scale of 0-10)	Future quality without offset (scale of 0-10)	Future quality with offset (scale of 0-10)																				
<i>Threatened species habitat</i>																												
Area of habitat	Yes	17.45	Adjusted hectares	180.18	Time over which loss is averted (max. 20 years)	20	Start area (hectares)	180.18	Risk of loss (%) without offset	90%	Risk of loss (%) with offset	5%	Raw gain	153.15	Confidence in result (%)	95%	Adjusted gain	145.50	Net present value	139.80	% of impact offset	88.96	Minimum (90%) direct offset requirement met?	509.81%	Yes			
					Future area without offset (adjusted hectares)	18.0	Future area with offset (adjusted hectares)	171.2																				
					Time until ecological benefit	5	Start quality (scale of 0-10)	3	Future quality without offset (scale of 0-10)	3	Future quality with offset (scale of 0-10)	6	Raw gain	3.00	Confidence in result (%)	95%	Adjusted gain	2.85	Net present value	2.82								
<i>Threatened species</i>																												
Number of features e.g. Nest hollows, habitat trees	No																											
Condition of habitat Change in habitat condition, but no change in extent	No																											
Birth rate e.g. Change in nest success	No																											
Mortality rate e.g. Change in number of road kills per year	No																											
Number of individuals e.g. Individual plants/animals	No																											

Summary							
Protected matter attributes	Quantum of impact	Net present value of offset	% of impact offset	Direct offset adequate?	Cost (\$)		
					Direct offset (\$)	Other compensatory measures (\$)	Total (\$)
Birth rate	0				\$0.00		\$0.00
Mortality rate	0				\$0.00		\$0.00
Number of individuals	0				\$0.00		\$0.00
Number of features	0				\$0.00		\$0.00
Condition of habitat	0				\$0.00		\$0.00
Area of habitat	17.45	88.96	509.81%	Yes	\$0.00	N/A	\$0.00
Area of community	0				\$0.00		\$0.00
					\$0.00	\$0.00	\$0.00