Vegetation and habitat assessment

Arnhem Space Centre

Equatorial Launch Australia

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1 INTRODUCTION

EcOz Environmental Consultants (EcOz) has been engaged by Equatorial Launch Australia Pty Ltd (ELA) to prepare a vegetation and habitat assessment to support a development proposal for NT portion 1646, 22730 Central Arnhem Road ('the project area') as part of the ELA's Phase 2 Expansion of the Arnhem Space Centre ('the Project'). The project area is approximately 305 ha and is situated on the existing Gulkula Mine site, approximately 30 km south of Nhulunbuy along the Central Arnhem Road (Figure 1-1). Within this project area, the proponent wishes to clear approximately 91 ha of intact vegetation[1] as well as some of the rehabilitated areas of the Gulkula Mine. The final area of vegetation regrowth to be cleared will be confirmed when master planning work is completed in June/July 2024. A 5 ha dam has also been proposed within this clearing footprint.

The Gulkula Mine site lies on top of the Dhupuma Plateau, a narrow bauxite capped plateau situated approximately 100 m above the valley floor below. The plateau was used as a tracking station for the European Launcher Development Organisation (1966-1970), and bauxite has been mine by Gulkula - an Indigenous owned company (2017 – present). The Arnhem Space Centre was established in in the southern end of the Gulkula Mine, with their first launch in June 2022. The ELA plans to utilise the whole 305 ha project area once the Mine ceases operations in late 2024.

The objectives of this report are to:

- Map land types at a scale of 1:10,000 and identify significant vegetation communities.
- Describe the vegetation composition and structure of the project area (both intact and rehabilitated areas).
- Provide an assessment of the quality of threatened species' habitat within the project area.
- Assess the likelihood of occurrence for threatened species[2] and determine the likely impact to these species from the proposed land clearing[3].

The report concludes that the intact vegetation across the plateau is predominantly *Eucalyptus tetrodonta* open woodland with some pockets of monsoon forest on the southern plateau side slopes. The rehabilitated areas consist of a developing canopy of *Acacia, Grevillea* and *Eucalyptus* species at different stages of growth. With respect to threatened fauna the habitat is generally of low to moderate quality, mostly due to frequent fires, and is generally consistent with the habitat quality of the region.

[1] An additional clearing area of ~10 ha was added while this report was in draft. The area has been included in the 91 ha area quoted here and the vegetation and habitat assessments of this new area is discussed in Sections 4.2.2 and 4.2.5

[2] According to *Territory Parks and Wildlife Conservation Act* (TPWC) and *Environmental Protection and Biodiversity Conservation Act* (EPBC)

[3] This report aims to provide detailed baseline information that will underpin development, design and management decisions. It consolidates all matters of conservation significance identified from desktop research and field investigations, with particular consideration for priority species which may require management actions beyond the general minimal impact standards. This report does not assess the significance of potential impacts.

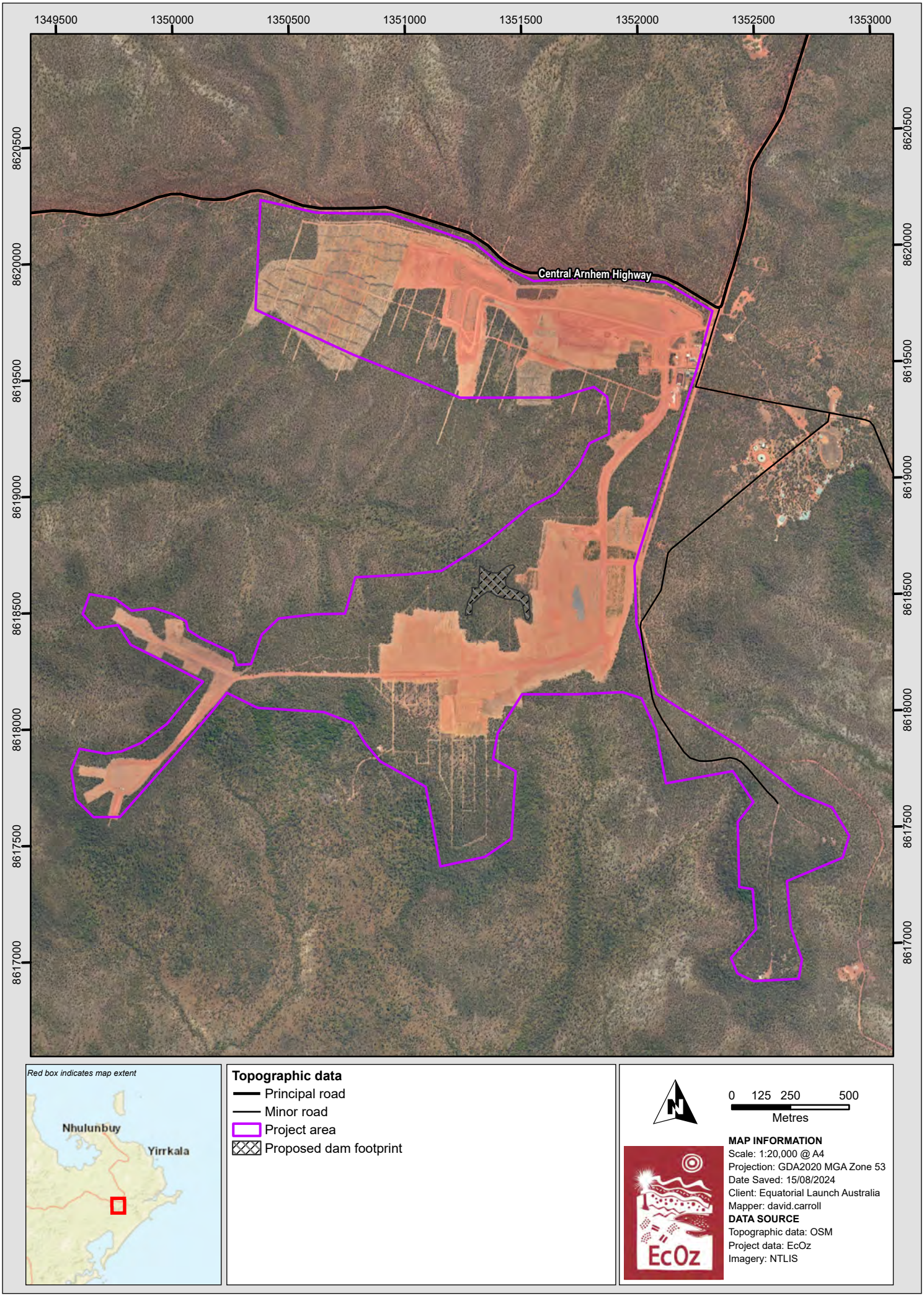

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Figure 1-1. Map of project area (note this is not a map of the clearing footprint)

2 ENVIRONMENTAL CONTEXT

The environmental values of the project area are described in this section and utilised in Sections 3 to inform the 'likelihood of occurrence' of threatened and migratory species. The information for this section mostly comes from desktop databases and reports and was supplemented by a site visit in April 2024.

2.1 Method

A desktop review of satellite imagery and online land information databases was undertaken to map land types across the study area and to identify potentially sensitive or significant vegetation types. The online government resource 'NR Maps' and government publications were used to source the following data:

- Location of areas of environmental significance
- Location of waterways and areas of seasonal inundation
- Land systems (1:250,000)
- NT Government (NTG) flora and fauna records

Previous ecological survey reports were consulted and are summarised in Section 2.1.2. A threatened species 'likelihood of assessment' was also undertaken for the study area; the procedure and results of this assessment are presented in Section 3.

2.1.1 Bioregion

Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. They are linked to fauna and flora assemblages and processes at the ecosystem scale, thus providing a useful means for simplifying and reporting on more complex patterns of biodiversity (NSW 2003). NT bioregions are described in Baker et al. (2005).

The project area occurs within the Arnhem Coast bioregion which comprises a coastal strip extending from just east of Cobourg Peninsula to southeastern Arnhem Land (Baker et al. 2005). Inland, the vegetation is typically eucalypt tall open forest, dominated by *Eucalyptus miniata* and *Eucalyptus tetrodonta*, with smaller areas of monsoon rainforest and eucalypt woodlands.

2.1.2 Land system mapping

No land unit mapping currently exists for the project area. NT Government land system mapping (at a scale of 1:250,000) describes the landforms within the project area as lateritic plains and rises with vegetation dominated by tall open woodland of *E. tetrodonta, E. miniata, C. bleeseri, Erythrophleum chlorostachys, E. tectifica* over a sparse to mid-dense grass cover (*Heteropogon triticeus, Chrysopogon fallax, Sorghum* spp).

2.1.3 Existing threatening processes

There are multiple threatening processes to biodiversity in the region. These are discussed below.

Fire

Regular fires have always been a natural part of the environment in the Top End. However, frequent fires can result in fewer flora species and reduced structural complexity (McKay 2017), both of which can also significantly diminish the habitat quality for fauna and facilitate weed invasion.

Regional fire history and fire scar mapping was obtained through the Northern Australia and Rangelands Fire Information (NAFI) website. In the past 10 years, the majority of the project area has been burned at least 4

times (Figure 2-1). Fires are more frequent on the fringes of the northern, western and southern edges of the project area, particularly just outside the southern boundary where fires have occurred in 7-8 of the past 10 years. All these fires records are of late season fires. Late season fires (from August onwards) are typically hotter than those occurring earlier in the dry season and usually more detrimental to flora and fauna.

In 2023, cool fires burned through much of the southern portion of the lease (Carly Smith, ASC Site Maintenance Assistant, pers. comm. 2 April 2024). NAFI data identifies that the least burnt areas correspond to assessment sites S9 and S10, which have not been burnt since 2018.

Overall, the satellite data as well as field observations (fire scars, *E. chlorostachys* resprouts, other coppicing regrowth) indicate that the vegetation of the project area, despite some small variations depending on location, is subject to regular late season fires, especially from the south.

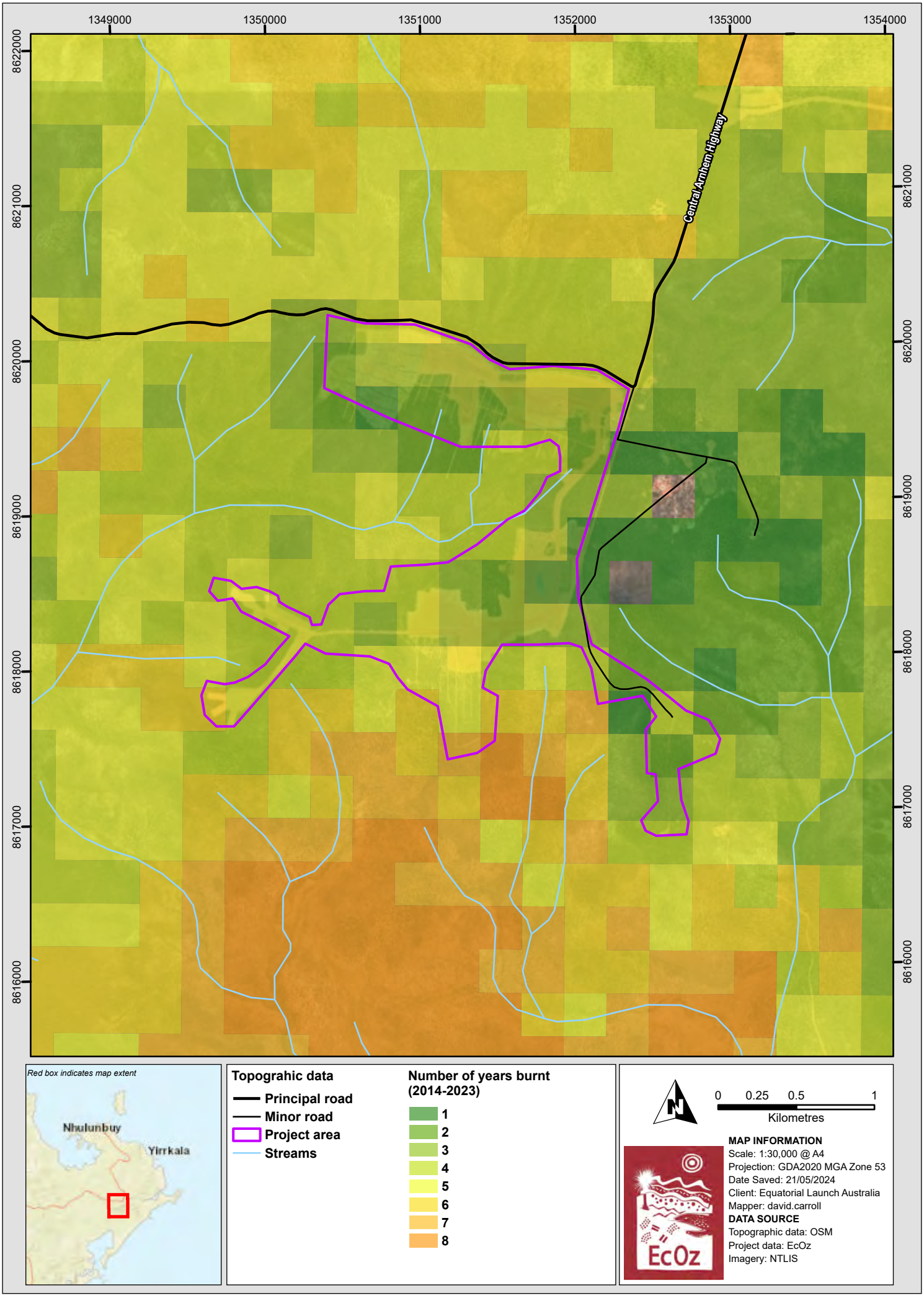

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Figure 2-2. Map of fire frequency within project area 2014-2023

Weeds

Some species of introduced flora are declared to be weeds under the NT *Weeds Management Act*. Class A weeds are to be eradicated by landowners and occupiers. Class B weeds must have their growth and spread controlled. The remaining introduced flora species are referred to as *environmental weeds*. The Commonwealth Government has also categorised some species as Weeds of National Significance (WoNS).

A review of the NT Weed Branch weed dataset shows that there are 33 weed records within a 10 km radius of the project area, probably related to a low survey effort due to the remoteness of the site. All of the NT declared weeds within this buffer, as well as any environmental weeds are listed in Table 2-1.

An incidental weed survey was undertaken across the project area during the survey. None of the weeds listed in Table 2-1 were observed within the project area; however, Hyptis (*Mesosphaerum* (*Hyptis*) *suaveolens*), a class B weed, was noted within the monsoon vine forest during a previous EcOz survey (2019).

The project area lies within the *Darwin Regional Weed Management Plan 2021-2026* (DEPWS 2021b). That plan focusses on weeds that are most important to the region, categorising them as either:

- Category 1 – Priority weeds for eradication
- Category 2 – Priority weeds for strategic control (including eradication of outliers)
- Category 3 – Weeds of concern – prevent spread
- Category 4 – Hygiene or biosecurity weeds – prevent spread
- Category 5 – Alert weeds - eradication on detection

Table 2-1. Weed species relevant to the project area

Common name	Botanical name	Class	WoNS	Status in management plan	Recorded in project area
Yellow Oleander	*Cascabela thevetia*	Environmental	No	N/A	Yes
Mission Grass - annual	*Cenchrus pedicellatus*	Environmental	No	Category 3 – Weeds of concern – prevent spread	No
Mission Grass - perennial	*Cenchrus polystachios*	B	No	Category 2 – Priority weeds for strategic control (including eradication of outliers)	Yes
Gambia Pea	*Crotalaria goreensis*	Environmental	No	Deemed low risk	Yes
Indian goosegrass	*Eleusine indica*	Environmental	No	N/A	Yes
Milkweed	*Euphorbia heterophylla*	Environmental	No	N/A	Yes
White Teak	*Gmelina arborea*	Environmental	No	N/A	Yes
Hyptis	*Mesosphaerum* (*Hyptis*) *suaveolens*	B	No	Category 4 - Hygiene and biosecurity weeds – prevent spread	Yes
Sida	*Sida acuta*	B	No	Category 4 - Hygiene and biosecurity weeds – prevent spread	Yes
Sida	*Sida cordifolia*	B	No	Category 4 - Hygiene and biosecurity weeds – prevent spread	Yes

Pest animals

According to the NT Fauna Atlas, at least four introduced fauna species are widespread and abundant within the region, and hence likely to occur within the project area. These are Feral Cattle (*Bos taurus*), Water buffalo (*Bubalus bubalis*), Feral Cat (*Felis catus*), Feral Pig (*Sus scrofa*), Cane Toad (*Rhinella marina*). Evidence of Feral Cattle and/or Water buffalo (scats and tracks) was observed during the field assessment in April 2024.

2.1.4 Previous biodiversity surveys

This section presents a list of recent surveys of the Dhupuma Plateau and surrounds as well as a summary of key findings.

Ecosmart Ecology (2015) *Dhupuma Plateau: Terrestrial Fauna Survey and Assessment.* [unpublished report]

Presents findings of fauna survey commissioned by Gulkula Mining Pty Ltd over 12 days in 2014/15 within a 500 ha area, to fulfil requirements for a Mining Management Plan (MMP). Deployed a combination of IR camera traps, Anabat devices, Elliot traps, and active searching mostly in the northern section of the project area (near assessment sites S12 and CS2) as well as near S7, S9 and S2 in the south. Concluded that no *TPWC* or *EPBC Act* listed threatened fauna species were likely to occur within areas affected by proposed actions (i.e. Gulkula Mine), largely because the vegetation type (*E. tetrodonta*) is common and widespread throughout the region. A possible exception was the Gove Crow Butterfly, whose habitat was thought to occur 850 m west of the project area, at the West Soak.

Mitchell, A. (2015) *Flora and Vegetation Survey Report: Proposed Gulkula Mine.* [unpublished].

Report commissioned by Gulkula Mining Pty Ltd as part of the environmental baseline assessment for the Mine. Report provides assessment of flora species and vegetation of mine site area. Found that the *Eucalyptus tetrodonta* woodlands, the predominant vegetation community within the region, is also the dominant vegetation type of the Dhupuma Plateau. Minor variations in the stringybark woodland were considered to be associated with the position of the vegetation in the terrain. Apart from these minor variations, the vegetation was described as "extremely uniform". A key finding is that "The plateau environment is harsh and has high levels of tree mortality due to prevailing dry season winds, shallow soils, frequent bushfire and cyclones. Consequently the vegetation present is of limited stature and species diversity."

Wills, J. and M. Annandale (2017) *Vegetation comparison between the western and central areas of the Dhupuma Plateau in the Gove region of the Northern Territory, Australia.* Tropical Forests and People Research Centre, University of the Sunshine Coast (USC), Maroochydore.

Report commissioned by the Gumatj Corporation to compare the vegetation between the central and western sides of the Dhupuma Platueau. Eight 500 m^2 transects spread over the western side of the study area were sampled and compared to pre-existing data. Report states: "Due to the frequent cyclones and wildfires the vegetation on the plateau has a sparse large-tree layer with a thick layer of coppicing regrowth.". The report found that the structure and composition of the western and central areas of the plateau are uniform and therefore have comparable habitat and conservation value.

Ecoz (2017) *Gove Crow Butterfly – habitat assessment.* [unpublished].

Report on Gove Crow Butterfly habitat commissioned by Gulkula Mining as part of their environmental assessment process. Found that neither the West or East Soak were ideal habitat for the species, and that the Butterfly had not been recorded there, although the report could not definitively rule out this possibility.

Ecoz (2019) *Land Capability Assessment for Arnhem Space Centre*. [unpublished report].

Report prepared for Gumatj Corporation to determine suitability of south-western portion of site for development of Phase 1 of the Arnhem Space Centre. Describes vegetation, soil and landscape attributes for three land types found within the 61 ha project footprint (where current ASC launch pads and administrative buildings are located). Found that only land type 1 – the plateau surface – was suitable for development.

3 PRELIMINARY THREATENED SPECIES ASSESSMENT

To determine which threatened species have potential to occur within the project area, analysis of regional flora and fauna records – informed by the results of the Commonwealth and NT threatened species search tools (described below) – was undertaken. For each of these species, the likelihood that the species occurs within the project area was then assessed based on habitat requirements, distribution, and the number and dates of proximate records. The purpose of such an assessment was to identify those species that required further consideration (including, possibly, field surveys), and those that can be reasonably excluded from further assessment because they are unlikely to occur within the project area.

For this report, the project area is limited to the sub-lease within which land will be cleared and all infrastructure will be placed (i.e. not the flight path of rockets launched from the site, which will be addressed in a separate document).

This report focusses on species that are listed as Vulnerable, Endangered or Critically Endangered under the NT *Territory Parks and Wildlife Conservation Act* (*TPWC Act*) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC Act*).

3.1 Procedure

The following procedure was used to determine which threatened species have the potential to occur in the project area:

- Identify all threatened flora and fauna records for the Arnhem Coast bioregion using the latest NT Flora and Fauna Atlas database (last updated in April 2024).
- Use the Protected Matters Search Tool to determine species listed as threatened under the *EPBC Act 1999* (undertaken March 2018). A buffer of 50 km around the project footprint was applied.
- Combine the results to generate a list of threatened species that may occur within the bioregion intersected by the project area.
- Collate the following details for each of those species – conservation status (NT and Commonwealth), habitat requirements, distribution, and number of records within the search area (from the NT Fauna and Flora Atlas dataset).
- Analyse the likelihood that each species will occur in the project area by applying the following likelihood classifications.

Table 3-1. Ratings for the desktop threatened species likelihood of occurrence assessment

Rating	Definition
HIGH	It is expected that this species occurs within the project footprint because there is core habitat and recent (post-2000) proximate records or knowledge that the species occurs in the local area.
MEDIUM	Species may occur within the project footprint because there is suitable habitat; however, there is evidence that lowers its likelihood of occurrence (known range contraction of the species in the region, no recent records within or close to the solar farm footprint, substantial loss of habitat within the project footprint since previous records, species is naturally-rare or occurs at a low density etc.).
LOW	Species may occur, as a vagrant, within the project footprint; only marginally-suitable habitat is expected.
NONE	There is strong evidence that this species will not occur within the project footprint (i.e. there is no suitable habitat and/or the species is considered to be regionally-extinct).

3.2 Likelihood of occurrence assessment

A total of **65** threatened species were considered in the 'likelihood of occurrence' assessment. Of these, 15 were discounted because they were either marine or freshwater species, neither of which occurs within the project area. The results for the remaining **50** species from the threatened species 'likelihood of occurrence' assessment are presented in Table 3-2, and summarised as follows:

- **Five** species have a medium likelihood of occurring, meaning it is expected that these species occur within the project area (at least seasonally) because of the presence of suitable habitat, and/or there are recent proximate records.
- The remainder have a low or no likelihood of occurring, meaning that apart from the occasional vagrant, it is not expected that these species occur within the project area.

Table 3-2. Threatened species 'likelihood of occurrence' assessment summary

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
MEDIUM	Black-footed Tree-rat (Kimberley and mainland Northern Territory subsp.)	*Mesembriomys gouldii gouldii*	Mammal	EN	EN	Marginally-suitable habitat in the project area and no records for the plateau or in Ecosmart Ecology 2015 fauna survey. Several records within 10 km (2013).
	Northern Brushtail Possum (Common Brushtail Possum (north-western)	*Trichosurus vulpecula arnhemensis*		VU	-	Marginally suitable habitat, no recent proximate records.
	Northern Quoll	*Dasyurus hallucatus*		EN	CR	Suitable habitat, but severe range contraction / population decline due to Cane Toads. No recent proximate records on mainland.
	Floodplain Monitor	*Varanus panoptes*	Reptile (terrestrial)	-	VU	Suitable habitat but no proximate records. Severe population decline due to Cane Toads
	Northern Blue-tongued Skink	*Tiliqua scincoides intermedia*		CR	-	Suitable habitat, but severe population decline due to Cane Toads
LOW	Australian Painted Snipe	*Rostratula australis*	Bird	EN	EN	Vagrant in the NT and no nearby records
	Crested Shrike-tit (northern subsp.)	*Falcunculus frontatus whitei*		VU	-	Possibly-suitable habitat but few regional records. Nearest record is 70 km west (2009).
	Gouldian Finch	*Erythrura gouldiae*		EN	VU	Suitable foraging habitat but edge of distribution; no proximate records or breeding habitat in project area.
	Grey Falcon	*Falco hypoleucos*		VU	VU	Vagrant in the NT and no nearby records

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
	Masked Owl (mainland Top End)	*Tyto novaehollandiae kimberli*		VU	VU	Limited nesting habitat within project area. Few regional records.
	Partridge Pigeon (eastern subsp.)	*Geophaps smithii smithii*		VU	VU	Possibly-suitable habitat but few regional records (two to the south are geo-spatial errors). Severe range contraction
	Red Goshawk	*Erythrotriorchis radiatus*		EN	VU	No suitable habitat in project area. One record near Yirrkala 2020.
	Fawn Antechinus	*Antechinus bellus*	Mammal	VU	EN	No suitable habitat in the project area but potential habitat in monsoon vine forest nearby. Severe range contraction / population decline
	Golden Bandicoot	*Isoodon auratus*		VU	EN	Marginal habitat in project area and species does not occur on mainland due to severe range contraction / population decline.
	Golden-backed Tree-rat	*Mesembriomys macrurus*		-	CR	Suitable habitat in the project area, but no proximate records and severe range contraction / population decline.
	Ghost Bat	*Macroderma gigas*		VU	-	Marginally suitable habitat. Only one proximate (4 km) record in 1990.
	Northern Brush-tailed Phascogale	*Phascogale pirata*		VU	EN	Suitable habitat, but severe range contraction / population decline. No recent records in Eastern Arnhem Land.
	Bare-rumped Sheath-tailed Bat	*Saccolaimus saccolaimus (nudicluniatus)*		VU	-	Suitable foraging habitat but no nesting habitat within project area. No records for species in East Arnhem Land.
	Pale Field-rat	*Rattus tunneyi*		-	VU	No suitable habitat within project area but drainage areas nearby may support species.
	a sedge	*Eleocharis retroflexa*	Plant	VU	DD	Possibly-suitable habitat, but no proximate records
	a fern	*Sticherus flabellatus*		-	VU	Possibly-suitable habitat, but no proximate records
	a sedge	*Mapania macrocephala*		-	VU	Possibly-suitable habitat, but no proximate records
	a tree	*Pternandra coerulescens*		-	VU	Possibly-suitable habitat, but project footprint outside catchments containing records

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
NONE	Asian Dowitcher	*Limnodromus semipalmatus*	Bird	VU	-	No suitable habitat, no proximate records and very few for the Gulf
	Bar-tailed Godwit subsp.	*Limosa lapponica subsp. menzbieri / baueri*		EN	CR /VU	No suitable habitat in the project area and few proximate records No suitable habitat and relatively-few proximate records
	Black-tailed Godwit	*Limosa limosa*		EN	-	
	Common Greenshank	*Tringa nebularia*		EN	-	
	Eastern Curlew	*Numenius madagascariensis*		CR	CR	
	Great Knot	*Calidris tenuirostris*		VU	CR	
	Greater Sand Plover	*Charadrius leschenaultii*		VU	VU	
	Grey Plover	*Pluvialis squatarola*		VU	-	
	Red Knot	*Calidris canutus*		EN	VU	
	Ruddy Turnstone	*Arenaria interpres*		VU	-	
	Sharp-tailed Sandpiper	*Calidris acuminata*		VU	-	
	Terek Sandpiper	*Xenus cinereus*		EN	-	
	Curlew Sandpiper	*Calidris ferruginea*		CR	CR	
	Lesser Sand Plover	*Charadrius mongolus*		EN	EN	No suitable habitat, no proximate records
	Brush-tailed Rabbit-rat	*Conilurus penicillatus*	Mammal	VU	EN	Suitable habitat, but severe range contraction / population decline
	Northern Hopping-mouse	*Notomys aquilo*		EN	VU	No suitable habitat in project area. Found only on Groote Eylandt due to severe range contraction / population decline.
	Nabarlek (Top End subsp.)	*Petrogale concinna canescens*		EN	EN	No suitable habitat and no records for the bioregion
	Water Mouse	*Xeromys myoides*		VU	-	Possibly-suitable habitat, but no records for the Gulf
	a climber	*Freycinetia excelsa*	Plant	-	VU	No habitat or regional records
	a subshrub	*Erythroxylum sp. Cholmondely Creek*		VU	EN	Range restricted to one site closer to Gove
	a tree	*Intsia bijuga*		-	CR	Range restricted to one site closer to Gove
	a bladderwort	*Utricularia singeriana*		-	VU	No suitable habitat or proximate records
	Arafura Snake-eyed Skink	*Cryptoblepharus gurrmul*	Reptile	EN	EN	Restricted-range to islands in the west of the bioregion
	Mertens' Water Monitor	*Varanus mertensi*		EN	VU	Regional records, but no habitat
	Mitchell's Water Monitor	*Varanus mitchelli*		CR	VU	No nearby records and no habitat

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
	Oenpelli Python	*Nyctophilopython oenpelliensis*		-	VU	Range restricted to western Arnhem Land escarpment
	Plains Death Adder	*Acanthophis hawkei*		VU	VU	No suitable habitat and no records for the bioregion

Key: CR = Critically Endangered, CD = Conservation Dependent, EN = Endangered, VU = Vulnerable, DD = Data Deficient

4 FIELD ASSESSMENT

4.1 Method

Survey design

A land type map was created based on the desktop assessment. Land types were chosen so that information could be collected to support a land capability assessment – to be submitted separately.

Thirteen full assessment sites (S1 to S13) and three rapid check-sites (CS1 to CS3) were chosen that represented all land types within the project area (Figure 4-1). Four reference sites from a previous land capability assessment report (EcOz 2019) were chosen to view to help ensure consistency (Figure 4-1). The 2019 assessment results were used in creating of a land type map and are included in Figure 4-1.

Field assessment overview

A field assessment of the project area was undertaken by two EcOz senior environmental consultants, Simon Aylott and Andrew Lewis on 2 to 4 April 2024. After visiting the reference sites, each assessment and check-site was visited on foot to ground-truth the land type map and to record soil, landform, vegetation and habitat attributes. The same landform and soil attribute data was collected at the full assessment sites as well as check sites. However, the check sites did not include detail about plant species height and % cover. The methods used to collect this information are described below and the information collected is provided in Appendix A.

Soil and landform types

Soils were described at all sites based on surface characteristics only (although depth was recorded at most sites). Each assessment was described in accordance with the *Australia Soil and Land Survey Field Handbook* (NCST 2009) and the *Munsell Soil Colour Charts* (Munsell 2009). Surface soil descriptions and site photographs were collected and are provided in Appendix A. Information about landform was recorded – including landform element, description, and slope. This information, in combination with vegetation indicators, provides insight into soil drainage and absorption capacity.

Vegetation

Vegetation was described at full assessment sites to National Vegetation Information System (NVIS) Level 5 detail, in line with the *NT Guidelines and Field Methodology* (Brocklehurst et al. 2007). Within each stratum (upper, mid and lower), three dominant species were recorded, cover was estimated and height was measured using the categories presented in Table 4-1 and Table 4-2. Vegetation at check sites was recorded to NVIS Level 3 detail.

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Table 4-1. Summary of cover and structural classification (NVIS) adopted to describe vegetation descriptions

Canopy cover (%)	Trees	Shrubs
<0.25	Isolated trees	Isolated shrubs
0.25 - 20	Open woodland	Sparse shrubs
20 - 50	Woodland	Open shrubland
50 - 80	Open forest	Shrubland
>80	Forest	Closed shrubland

Table 4-2. Summary of height classifications (NVIS) used to describe vegetation descriptions

Height (m)	Trees	Shrubs	Grass
>30	Tall	-	-
10 - 30	Mid	Tall	-
<10	Low	Mid	-
<3	-	Low	-
1 - 2	-	-	Tall
0.5 - 1	-	-	Mid
<0.5	-	-	Low

Habitat

In addition to the assessment sites, transects were walked at nine sites with intact vegetation (S1, S2, S3, S6, S9, S10, S11, S12 & S13). At each site, two parallel transects were walked to approximately 100 m. All mid-story species (1 m – 12 m) up to 2 m either side of each line were recorded by species name and location using a hand-held GPS. Any trees with a diameter larger than 40 cm were also recorded. Notes were made at each site about presence of hollow logs and density and composition of the ground layer. Transects were not conducted in the rehabilitated areas because these areas were deemed unlikely to support hollow-using animals (e.g. Woinarski et al. 2008). This is because hollows will only form in rehabilitation vegetation until they are at least 50 years old. The rehabilitated vegetation in the project area is 2-5 years old.

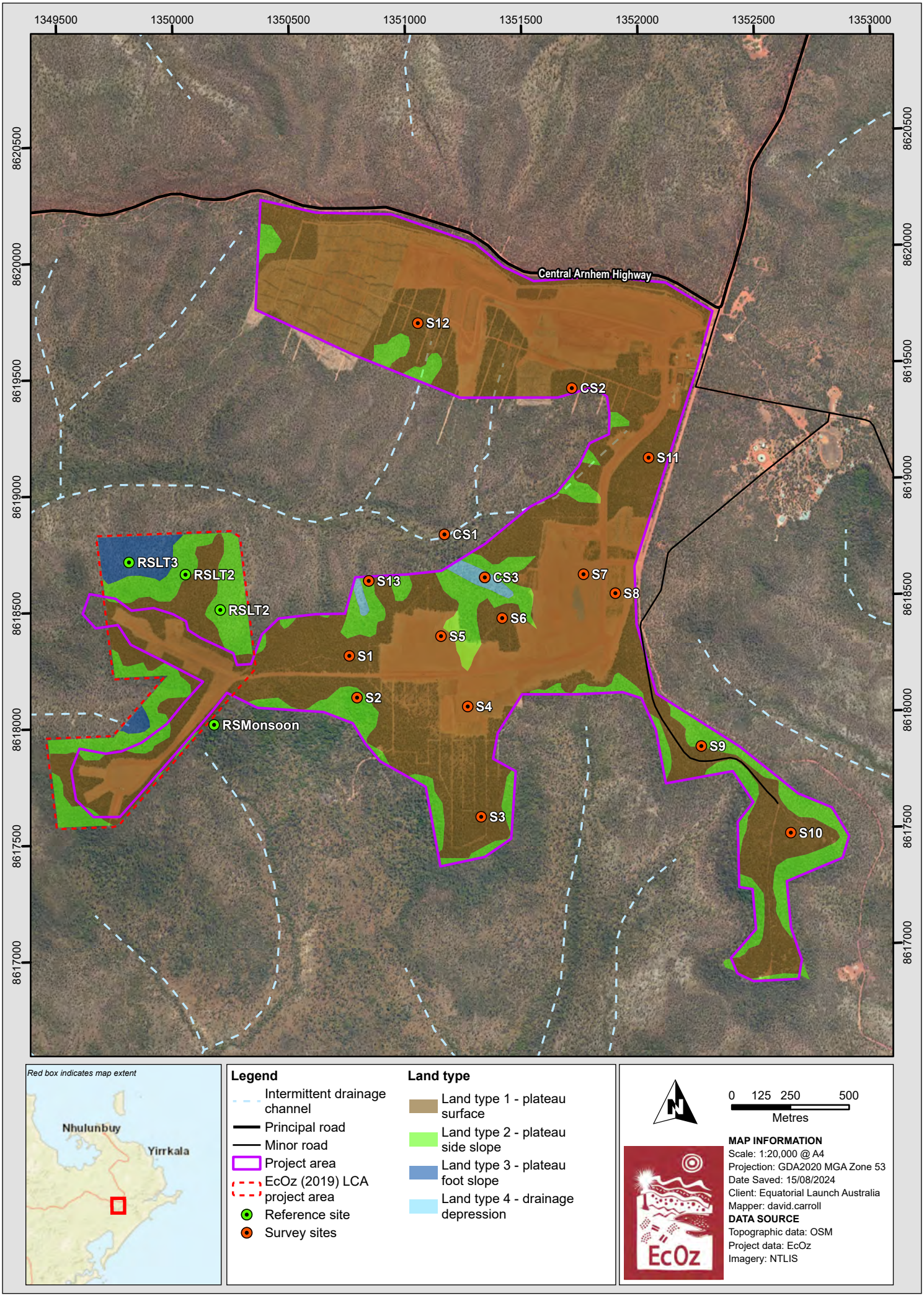

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Figure 2-1. Map of land types within project area

4.2 Results

4.2.1 Land types of the project area

Soil, landform and vegetation data has been summarised in Table 4-3 to provide descriptions for each land type recorded within the survey area. These descriptions were taken from a previous Land Capability Assessment (EcOz 2019) and verified across the rest of the site during the field assessment. A map outlining the identified land type boundaries is shown in Figure 4-1.

Table 4-3. Land type descriptions for the project area

Land type	Survey sites	Description
Land type 1 – Plateau surface	S1, S2, S3, S4, S5, S6, S7, S8, S10, S11, S12, CS2	Bauxitic plateau surface with slopes ranging from 1% to 5%. Supporting a *Eucalyptus tetrodonta* woodland. Supports species including *Livistonia humilis*, *Erythrophleum chlorostachys* and *Pandanus spiralis* in the shrub layer, overtopping well drained rocky, gravelly (rudosol) soils.
Land type 2 – Plateau side slope	S9, S13	Plateau side slope with slopes ranging from 15% to 45%. Supporting a *Eucalyptus tetrodonta* woodland. Supports species including *Livistonia humilis*, *Erythrophleum chlorostachys* and *Pandanus spiralis* in the shrub layer, overtopping well drained rocky, gravelly (rudosol) soils.
Land type 3 – plateau footslopes	RSLT3	Plateau foot slopes with slopes ranging from 4% to 5%. Supporting a *Eucalyptus tetrodonta* open woodland. Supports *Melaleuca viridiflora* and *Grevillea pteridifolia* in the shrub layer, overtopping shallow poorly drained sandy loam soils, receiving seepage and overland flows during the annual wet season.
Land type 3 – Drainage depressions	CS1, CS3	Drainage depressions associated with the higher plateau, with slopes ranging from 2% to 5%. Supporting a mid-high *Eucalyptus tetrodonta* open woodland with *E. miniata* over *P. spiralis, L. humilis* and *E. chlorostachys* high open shrubland. Mid-high sparse tussock grassland., overtopping poorly-drained brown sandy clay loam soils, receiving seepage and overland flows during the annual wet season.

A detailed overview of soil, landform and vegetation data is provided in Appendix A.

4.2.2 Vegetation

Eucalypt woodland

A Eucalypt woodland community is the dominant vegetation type across the project area and is typical of the region. It is relatively uniform in species composition and structure, composed of a *Eucalyptus tetrodonta* woodland with *Eucalyptus miniata* over *Livistona humilis* and a sparse understorey of *Heteropogon triticeus.* In most areas there were dense resprouts in the mid and ground strata, typically comprising *E. tetrodonta, E. miniata* (mid-strata), and *Erythrophleum chlorostachys* with *Buchanania obovata* and *Brachychiton megaphyllus* (ground strata). There was some minor variation between sites in structure and composition (Appendix A). For example, assessment site S10 had a higher density of immature *B. obovata* and *B. megaphyllus;* assessment site S9 had a greater number of mature *E. chlorostachys.* However, these variations can be explained by location and fire history – these two sites were the longest unburnt areas assessed during the field survey. The description of the intact vegetation provided here is similar to those of Mitchell (2015) and Wills et al. (2017). Both describe the vegetation on the plateau surface as being limited or sparse due to the harsh conditions there – an area which is subject to strong winds, cyclones, regular fires and shallow soils.

While the report was in draft, an additional clearing area of ~10 ha was added in the south-east. Because this specific area was not surveyed, the vegetation, habitat quality and presence of significant vegetation was inferred from assessment sites S9 and S10, NAFI fire history data and satellite imagery. From this, it is highly likely that the area has the same vegetation composition and structure as the rest of the plateau and is similar in habitat quality to assessment site S10, which is ~500 m north of the area. There is an abandoned residence in the south end of the area and approximately 0.13 ha of previously cleared land.

Figure 4-2. Photograph of intact *Eucalypt tetrodonta* woodland in the project area

Rehabilitated vegetation

The rehabilitated areas within the project area are at different stages of growth ranging from approximately 2-5 years. They contain a mix of species including *Acacia*, *Grevillea*, *Eucalypt* and *Corymbia.* The rehabilitated areas show a developing canopy only and therefore no hollow-bearing trees. Ground cover was sparse in all areas.

Figure 4-3. Photographs showing regrowth at two sites S4 (left) and S8 (right)

Monsoon vine forest

A monsoon vine forest patch was recorded on the southern plateau slope near assessment site S2, approximately 10 m below the edge of the plateau. This was near to where Mitchell (2015) conducted a transect (T10). The same patch was also observed at its western edge by van den Hoek (EcOz 2019), at a site approximately 600 m west of S2 at RSMonsoon (see Figure 4-1). Between these two points there is approximately 6 ha of monsoon vine forest, patchily distributed along the steep slopes of the plateau edge. More detail about this patch is provided in Section 4.2.5. based on the report by Van den Hoek (2019)

Smaller, isolated patches of potential monsoon vine forest in the area south of the plateau were identified following Mitchell's vegetation mapping methodology for closed forests, using satellite imagery to select areas that have dense vegetation with large tree crowns and very green vegetation relative to the surrounding communities (2015). Mitchell's own mapping of the area was also referenced, as well as the NVIS 6 vegetation mapping data (DCCEEW 2024). Using this methodology, a further four small areas of potential monsoon vine thicket were identified on the southern and south-eastern edge of the plateau (see Figure 4-7).

Figure 4-4. Photograph showing edge of monsoon vine forest (S2)

4.2.3 Drainage depressions

Drainage depressions were mapped at two sites within the project area, totalling ~2.4 ha. The initial desktop mapping was done using Google Earth satellite imagery. After the field work was completed, elevation data was accessed from NASA's Shuttle Radar Topography Mission to confirm the extent of these areas. The data had a XY resolution of 10-metres, allowing the elevation and terrain slopes to be visualised across the site.

These drainage depressions are relatively flat areas, approximately 50 m to 70 m wide, between adjacent foot slopes, that receive water from the plateau surface and gradual slope to the north and north-west. Both sites were traversed during the survey to investigate landform, surface soils and to characterise the vegetation. Details were recorded at CS3, because this was the site of the proposed clearing and possible construction of a tarn within this land type. Observations were also recorded outside of the project area, at CS1, to better understand the potential downstream impacts of the proposed tarn and to assess the vegetation at the intersection of several drainage depressions. These observations are detailed in Appendix A.

The drainage depression found at CS3 is relatively flat, gently sloping 1 to 3% to the north-west with a mid-high open woodland of *E. tetrodonta* and *E. miniata*. The vegetation is generally consistent with the vegetation across the whole project area, although it was noticeably greener than the other land types. There were no signs of pooling or surface water. While the vegetation was similar in species composition, the mid-storey layer was generally taller and with a denser ground layer. Fallen logs were more common in CS3, likely due to logging activity. It was noted that approximately six of the ten large trees in the area had been felled, indicating that this land type is capable of supporting large tree with hollows suitable for fauna, a significant vegetation type. These differences can be explained by increased water flow in this land type, improved soil quality through accumulation of sediments and reduced fire frequency (see Figure 2-1).

4.2.4 Habitat

Habitat can be defined as the place and resources that are used by a species. In this report, the habitat assessment methodology was informed by the foraging and nesting requirements of threatened species with a high or moderate likelihood of occurrence in the area, as well as threatened species of concern identified by the NT EPA as part of the referral process[4] (Table 4-4). As a result, the field assessment focused on the composition and density of the mid-story, the presence of hollow-bearing trees (also known as old-growth trees), and the density of the ground layer.

The overall assessment of this habitat in the project area is of a low quality, except within the two drainage depressions where water flow and increased protection from fire may provide some refugial habitat. This is confirmed by fire mapping of the area (see Figure 2-1), which shows significant areas of unburnt habitat to the west and east of the project area. The mid-story of the project area is dominated by *E. tetrodonta* resprouts and *L. humilis*. Two plants species, *B. obovata* and *B. megaphyllus* are found across the whole area as coppicing growth in the ground layer but are more prominent in the mid-story stratum of assessment sites S3 and S10, probably due to differing fire regimes at the site. *E. chlorostachys* occurs in most assessment sites as a dense coppicing growth, rarely higher than 1 m, except in assessment sites S2, S3, S9 and CS1, where it grows above 2 m. The low, dense coppicing growth of *E. chlorostachys* and the abundant resprouts of *B. obovata* in the ground stratum and *E. tetrodonta* in the mid-stratum are indicators that the site is subject to frequent fires. Figure 4-5 shows some of the habitat of the project area.

The drainage depressions consist of similar vegetation to the rest of the project area but have been afforded more protection from fire events and cyclones due to topography and water flows. No large hollows were identified despite four large trees being recorded near CS3.

The vegetation in the rehabilitated areas is immature (2 to 5 years old) and are therefore unlikely to support fauna that use hollows or rely on dense ground cover. Hollows will only form in vegetation that is at least 50 years old (Woinarski et al. 2008).

[4] See NT EPA Direction Ref EP2023/031

Figure 4-5. Photographs showing typical habitat within project area

Table 4-4 (below) describes the preferred habitat of seven threatened fauna species that historically have been found in the region. For each species, an evaluation has been made (low, moderate or high) of the value of the habitat within the project area (specifically the plateau surface) for this species.

Table 4-4. Habitat table for seven species

Species	Preferred habitat	Assessment
Black-footed Tree-rat (*Mesembriomys gouldii gouldii*)	Prefers woodlands and open forests with large trees and a moderately diverse mid-storey. Generally, require fruit and seed resources including Pandanus fruits, and fruiting trees and shrubs (Rankmore 2006). Shelters in tree hollows and occasionally Pandanus (DEPWS 2021d). Thought to be more prevalent in woodlands with infrequent and low intensity fires (Price et al. 2005).	LOW - Frequent fires, cyclones and shallow soils on the plateau surface limit the number of large trees for nesting and lower the mid-storey species diversity for foraging. Patches of monsoon vine thicket outside project area may provide some habitat.
Partridge Pigeon (*Geophaps smithii smithii*)	Prefers woodland dominated by *Eucalyptus tetrodonta* and *E. miniata* (Garnett et al. 2011). Favours a structurally-patchy savanna understorey at a relatively intricate scale. Prefer to feed in areas that have an open ground layer (e.g. following fire); however, more likely to nest where there is dense vegetation cover. Require the seeds of certain perennial grasses and sedges, particular the perennial grass species *Alloteropsis semialata* and *Chrysopogon* (Fraser 2001).	LOW - Plateau surface does not contain structurally patchy understorey due to the frequent fires. Perennial grass species *Alloteropsis semialata* and *Chrysopogon* not observed during field survey.
Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)	Prefers tall eucalypt open forests with large hollow-bearing trees (TSSC 2001). Found in higher abundance when shrub density is high, particularly shrubs that bear large, fleshy fruits (Stobo-Wilson 2019).	LOW - Plateau surface has a low density of large (>40cm DBH) trees. While mid-story fruiting trees, such as *B. obovata* and *B. megaphyllus* do occur, they are typically juveniles or resprouts and poor foraging habitat. Monsoon vine forest patches outside of the project area would potentially support this species.
Northern Brush-tailed Phascogale (*Phascogale pirata*)	Prefers tall open forests dominated by *E. miniata* and *E. tetrodonta* (Rhind et al. 2008). Are primarily arboreal and seldom feed on the ground. Insectivores.	LOW - Plateau surface has a low density of large (>40cm DBH) trees.
Fawn Antechinus (*Antechinus bellus*)	Prefers open forests and woodlands dominated by *E. miniata* and/or *E. tetrodonta*, particularly where these forests have a relatively dense shrubby understorey (Friend 1985). Declines in areas with frequent intense fires (Corbett et al. 2003) but not necessarily common in areas where fire has been excluded for long periods (>20 years; Woinarski et al. 2004).	LOW - Some areas of the plateau surface have a dense shrubby understorey made up of *E. chlorostachys* resprouts. However, this is linked with more frequent fires.
Floodplain Monitor (*Varanus panoptes*)	Broad range of habitats from coastal beaches to savannah woodlands (Christian 2004). Also common throughout floodplains grasslands and a variety of native woodlands (DEPWS 2021e).	LOW - Shallow soils on the plateau surface and a lack of permanent water reduce lower the habitat value of the project area for this species.
Northern Blue-tongued Skink (*Tiliqua scincoides intermedia*)	Prefers area of dense vegetation that provide cool and moist conditions, such as dense thickets within woodlands and monsoon vine thickets. Often found close to seasonal or permanent water (DCCEEW 2023).	LOW - The plateau surface is rapidly draining and does not contain water sources that would provide habitat for this species. At time of survey (April 2024) there was dense understorey that would provide protection from predators but this is temporary due to frequent fires. Would be a higher likelihood of occurrence around monsoon vine forest patches.

4.2.5 Significant or sensitive vegetation

Monsoon vine forest

Monsoon vine forests are considered a significant vegetation type under the NT land clearing guidelines as they are spatially restricted and important to a relatively large number of species. They are also sensitive to changes in hydrology and fire regimes.

The largest monsoon vine forest patch, located on the steep southern slopes of the plateau was not surveyed during the 2024 site visit by EcOz; however, there are two recent sources of information about this vegetation community by botanists David van den Hoek (2019) and Andrew Mitchell (2015).

David van den Hoek (EcOz), previously visited the eastern edge of the patch in 2019 as part of a land clearing application for Phase 1 of the ASC development. He described this vegetation community as "heavily dominated by *Diospyros maritima*, *Canarium australianum* and *Terminalia microcarpa* in the upper mid and ground strata. Other species he noted were *Sterculia quadrifida, Alstonia actinophylla, Schefflera actinophylla, Drypetes deplanchei* in the upper strata, *Tarenna australis, Cyclophyllum schultzii, Micromelum minutum, Litsea glutinosa* in the mid strata and *Alyxia spicata, Flagellaria indica, Smilax australis, Capparis spinosa, Hypoestes floribunda* in the ground strata.

Andrew Mitchell (2015) also visited this vegetation community in 2015 as part of a vegetation assessment of the area for the Gulkula Mine development. He conducted a transect at the western portion of the monsoon vine forest (termed 'Closed Forest'). Mitchell undertook a transect but did not record species but took photographs of the inside of the vine forest patch showing relatively clear ground story and dense coppice growth surrounding the patch, mainly of Cooktown Ironwood.

It was noted by van den Hoek (2019) and Mitchell (2015) that there was no evidence of perennial springs within this patch, while Michell noted that a possible perennial spring occurred south of the Garma Festival site (Figure 4-8). No threatened or restricted flora species were noted within the patch. Van den Hoek targeted two species listed as Vulnerable under the *Territory Parks and Wildlife Conservation Act - Pternandra coerulescens* and *Hernandia nymphaeifolia* – but did not record either of them. Mitchell stated that edge effects and disturbance to monsoon vine patches in the area made them unlikely to have species with limited geographic ranges or highly specialised requirements, although it is unclear if he was referring to this particular patch.

It is likely that the monsoon vine thicket has retreated from the edge of the plateau due to past fires and is relatively well protected from cyclones and fire in the shelter of the rocky plateau side slopes.

Regionally, rainforest exists extensively along the southern and western coastline with patches occurring to the south and east of the ASC development area. Within 5 km there are approximately 15 patches of monsoon vine forest, ranging in size from <1 ha to >12 ha, with a total area of ~42.6 ha an average size of 2.8 ha (Figure 4-8). These patches have been mapped from a combination of satellite imagery, NVIS 6 data and previous mapping by Mitchell (2015).

While the size of the monsoon vine thicket on the southern plateau side slope is larger than the average for this region (at ~6 ha), it is not known to contain a perennial spring (like the Garma site) or threatened / restricted range species. It is part of a network of monsoon forest patches in the region that would supply refugial habitat for fauna and support dispersal for monsoon flora species. It appears to be well protected from fire and relatively weed free. Considering that none of this community will be cleared by the development, it is considered that a 50 m buffer surrounding the community – as recommended by van den Hoek in 2019 – should be retained.

Hollow-bearing trees

The size of a tree (height and diameter at breast height) is linked to its age and the potential for that tree to support hollows critical for numerous hollow-dependent fauna species. The *Land Clearing Guidelines* states that a Eucalypt forest that has either five or more stems growing greater than 50 cm in diameter at breast height (DBH) per hectare, and/or 30 or more Eucalypt stems greater than 40 cm DBH per ha, is considered to be of high value for biodiversity (DEPWS 2021a).

Large trees were recorded during site assessments, habitat transects and incidentally during the field survey. Of a total of 27 large trees recorded, 18 had a DBH of >40 cm and 9 had a DBH of >50 cm (see Figure 4-7). The highest density of large trees (also known as old-growth trees) was found near check-site CS3, where four >50 cm DBH trees and seven >40 cm DBH trees were identified within a 2 ha area[5] (Figure 4-6). Because these fall below the land clearing guideline's threshold of 30 x >40 cm DBH per hectare or 5 x >50 cm DBH per hectare, this vegetation is not classified as significant.

Figure 4-6. Photograph of felled tree >50 cm DBH near S6

Drainage depression

Drainage depressions are level to gently inclined, long narrow, shallow open depressions with a smoothly concave cross-section. They are often poorly defined and characterised by the lack of an incised stream channel. The *Land Clearing Guidelines* (DEPWS 2024) considers disturbance of drainage areas problematic as it can have consequences in terms of flooding and erosion both on and offsite. The proposed construction of a tarn in this area will reduce water flow and therefore is unlikely to increase erosion or flooding risk.

The main risk from construction of a tarn would be to vegetation downstream, which depend on how much water will still be available into the drainage area. This report only considers the first 400m of the drainage area because the catchment for this area will be developed into the tarn. Beyond 400m, other catchments feed into the drainage depression.

[5] Also recorded were six stumps of felled trees that were >50 cm DBH.

Recent hydrological modelling by ELA estimate that approximately 25% of the water from the local catchment will be removed during the wet season with the remaining 75% released into the drainage area. The amount released into the environment will increase after the first two years as the tarn is filled up and surface water harvesting decreases. During the dry season, water will be released from the tarn into the environment to match historic averages. So, overall the drainage area will receive approximately 75% of historic rainfall averages during the wet season (increasing after two years) and normal water flows during the dry season.

Based on these estimates, the impacts on the vegetation within the drainage depression are not expected to be significant.

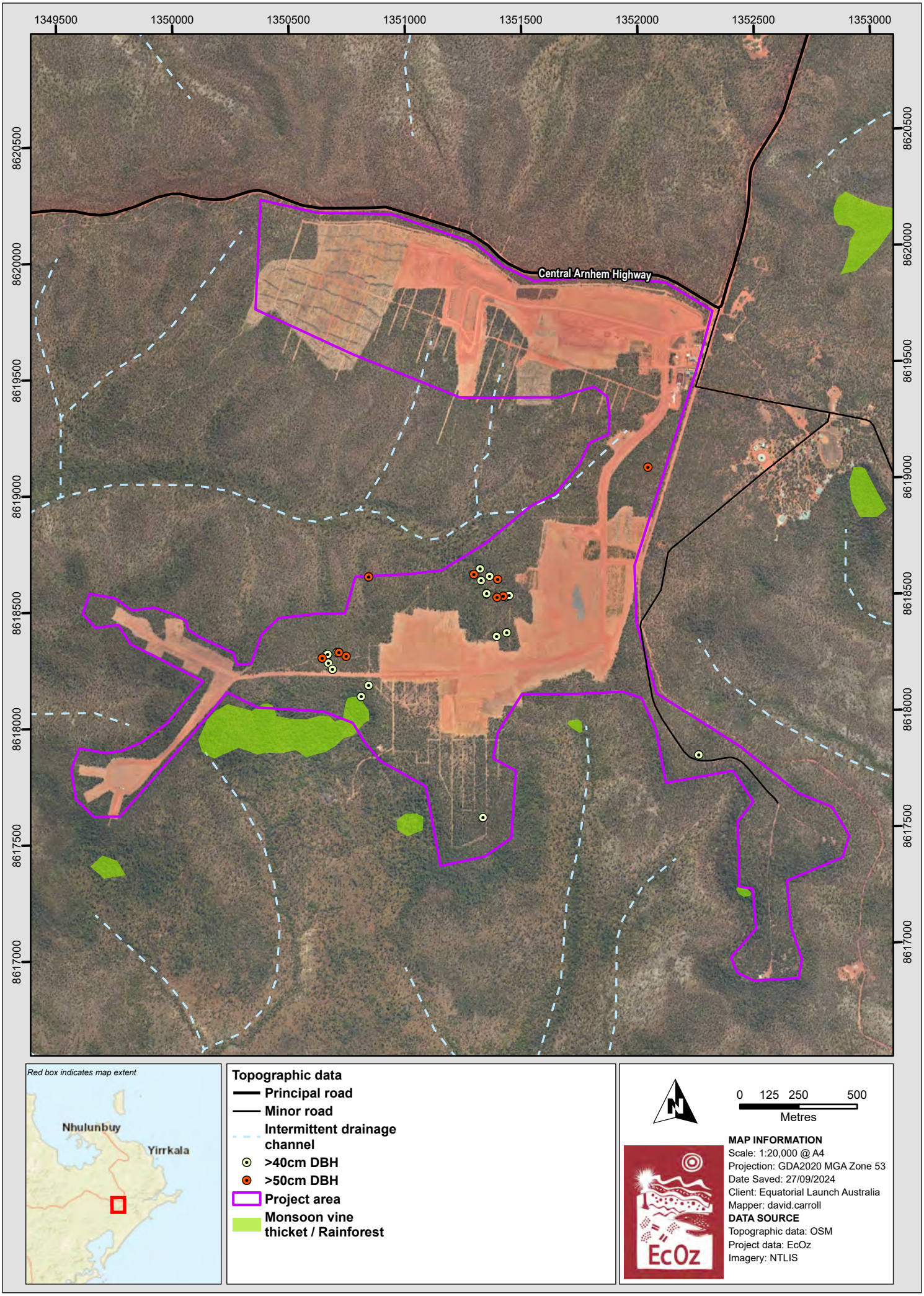

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FIgure 2-4. Map of significant vegetation within the project area

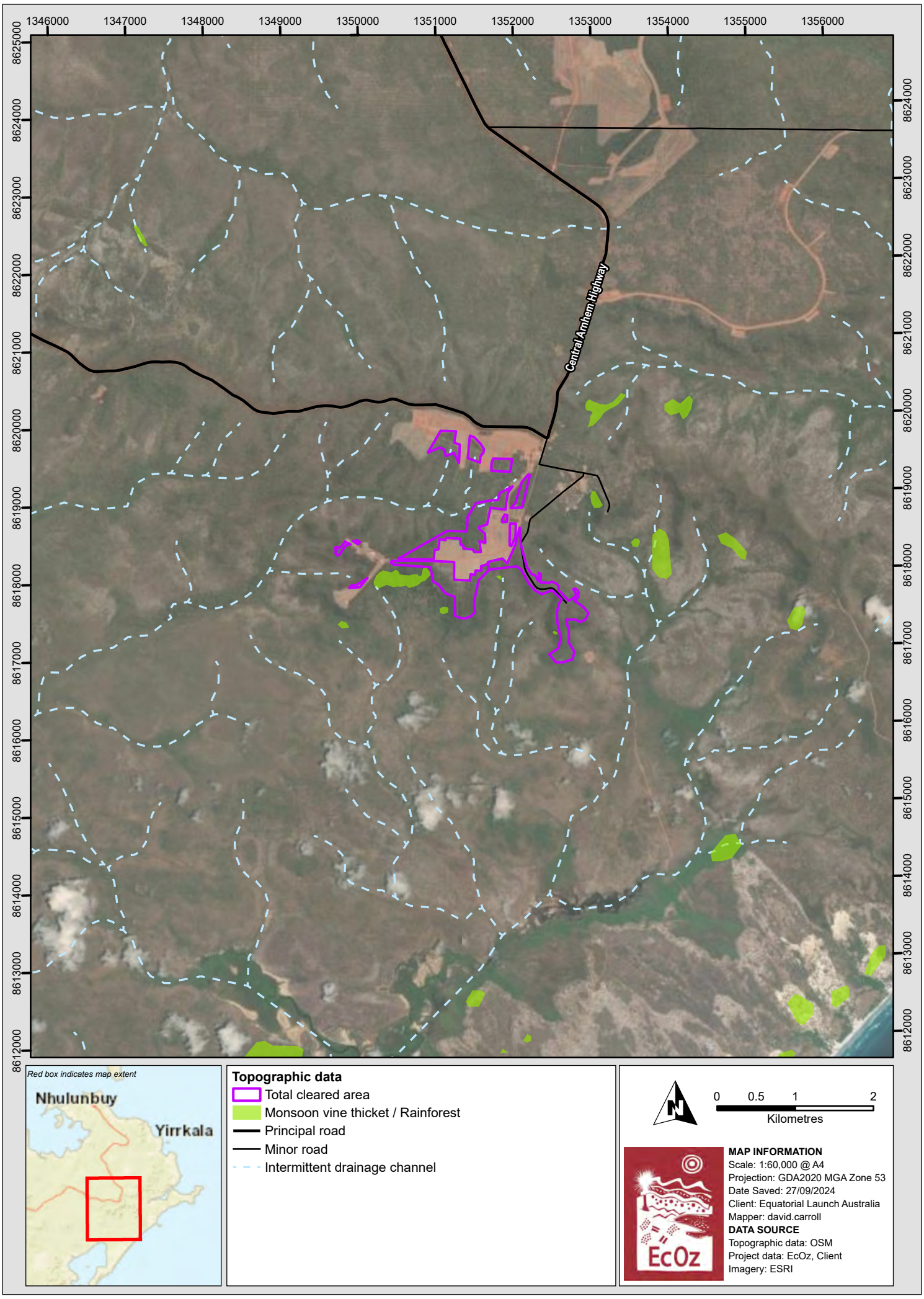

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Figure 4. Map of regional monsoon vine forest

5 DISCUSSION OF THREATENED SPECIES

5.1 Updated likelihood of occurrence assessment

This section presents an updated 'likelihood of occurrence' assessment based on the results of the field surveys.

The assessment found that all species had either a low or no likelihood of occurring, meaning that apart from the occasional vagrant, it is not expected that these species occur within the project area. These results are presented in Table 5-1, and summarised as follows:

Table 5-1. Threatened species 'likelihood of occurrence' assessment summary

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
LOW	Australian Painted Snipe	*Rostratula australis*	Bird	EN	EN	Vagrant in the NT and no nearby records.
	Crested Shrike-tit (northern subsp.)	*Falcunculus frontatus whitei*		VU	-	Suitable habitat but few regional records. Nearest record is 70 km west (2009).
	Gouldian Finch	*Erythrura gouldiae*		EN	VU	Marginal foraging habitat but limited nesting habitat due to lack of tree hollows. On edge of species distribution; no proximate records within 70km.
	Ghost Bat	*Macroderma gigas*		VU	-	Suitable foraging habitat only and only one proximate (4 km) record in 1990.
	Grey Falcon	*Falco hypoleucos*		VU	VU	Vagrant in the NT and no nearby records
	Masked Owl (mainland Top End)	*Tyto novaehollandiae kimberli*		VU	VU	Limited nesting habitat within project area due to lack of tree hollows. Few regional records.
	Partridge Pigeon (eastern subsp.)	*Geophaps smithii smithii*		VU	VU	Marginally-suitable habitat but few regional records (two to the south are geo-spatial errors). Severe range contraction.
	Red Goshawk	*Erythrotriorchis radiatus*		VU	VU	Few regional records (one record near Yirrkala 2020) and limited habitat in the project area with few tall trees and no watercourses.
	Black-footed Tree-rat (Kimberley and mainland Northern Territory subsp.)	*Mesembriomys gouldii gouldii*	Mammal	EN	EN	Marginally-suitable habitat in the project area. Several records within 10 km (2013), but no records of species from project area including in Ecosmart Ecology 2015 fauna survey.

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
	Fawn Antechinus	*Antechinus bellus*		VU	EN	No suitable habitat in the project area but potential habitat in monsoon vine forest nearby. Severe range contraction / population decline.
	Floodplain Monitor	*Varanus panoptes*		-	VU	Marginally suitable habitat in project area but no permanent water source, severe population decline due to Cane Toads.
	Golden Bandicoot	*Isoodon auratus*		VU	EN	Marginal habitat in project area and species does not occur on mainland due to severe range contraction / population decline.
	Golden-backed Tree-rat	*Mesembriomys macrurus*		-	CR	Suitable habitat in the project area, but no proximate records and severe range contraction / population decline.
	Northern Brush-tailed Phascogale	*Phascogale pirata*		VU	EN	Marginally suitable habitat with few large hollows and frequent fires; severe range contraction / population decline. No recent records in Eastern Arnhem Land.
	Pale Field-rat	*Rattus tunneyi*		-	VU	No suitable habitat within project area but drainage areas nearby may support species.
	Bare-rumped Sheath-tailed Bat	*Saccolaimus saccolaimus (nudicluniatus)*		VU	-	Suitable foraging habitat but no nesting habitat within project area. No records for species in East Arnhem Land.
	Northern Brushtail Possum (Common Brushtail Possum (north-western)	*Trichosurus vulpecula arnhemensis*		VU	-	Limited nesting habitat due to lack of large hollows in project area. Potentially suitable habitat within monsoon vine forest patches outside of project area. No records of species in the project area.
	Northern Quoll	*Dasyurus hallucatus*		EN	CR	Project area does not contain large boulders/rocks and few large hollows, severe range contraction / population decline due to Cane Toads. No recent proximate records on mainland.
	a sedge	*Eleocharis retroflexa*	Plant	VU	DD	No suitable habitat in project area, but no proximate records
	a fern	*Sticherus flabellatus*		-	VU	No suitable habitat, but no proximate records

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
	a sedge	*Mapania macrocephala*		-	VU	No suitable habitat as no springs observed, but no proximate records
	a tree	*Pternandra coerulescens*		-	VU	No springs observed and tree not recorded in 2019 survey. No records within project area.
	Northern Blue-tongued Skink	*Tiliqua scincoides intermedia*	Reptile	CR	-	Marginally suitable habitat due to lack of permanent water. No records in project area and lack of permanent water. Severe population decline due to Cane Toads.
NONE	Asian Dowitcher	*Limnodromus semipalmatus*	Bird	VU	-	No suitable habitat, no proximate records and very few for the Gulf
	Bar-tailed Godwit subsp.	*Limosa lapponica subsp. menzbieri / baueri*		VU/ CR	VU	No suitable habitat in the project area and few proximate records. No suitable habitat and relatively-few proximate records
	Black-tailed Godwit	Limosa limosa		EN		
	Common Greenshank	Tringa nebularia		VU	-	
	Eastern Curlew	*Numenius madagascariensis*		CR	VU	
	Great Knot	*Calidris tenuirostris*		VU	CR	
	Greater Sand Plover	*Charadrius leschenaultii*		VU	VU	
	Grey Plover	Pluvialis squatarola		VU	-	
	Red Knot	*Calidris canutus*		EN	VU	
	Ruddy Turnstone	*Arenaria interpres*		VU	-	
	Sharp-tailed Sandpiper	*Calidris acuminata*		VU	-	
	Terek Sandpiper	*Xenus cinereus*		EN	-	
	Curlew Sandpiper	*Calidris ferruginea*		CR	CR	
	Lesser Sand Plover	*Charadrius mongolus*		EN	EN	No suitable habitat, and no proximate records
	Brush-tailed Rabbit-rat	*Conilurus penicillatus*	Mammal	VU	EN	Marginally-suitable habitat, but severe range contraction / population decline.
	Nabarlek (Top End subsp.)	*Petrogale concinna canescens*		EN	EN	No suitable habitat and no records for the bioregion
	Northern Hopping-mouse	*Notomys aquilo*		EN	VU	No suitable habitat in project area. Found only on Groote Eylandt due to severe range contraction / population decline.

Likelihood	Common name	Scientific name	Class	Status		Justification
				Cth	NT	
	Water Mouse	*Xeromys myoides*		VU	-	No suitable habitat, no records for the Gulf region
	a climber	*Freycinetia excelsa*	Plant	-	VU	No habitat or regional records
	a subshrub	*Erythroxylum sp. Cholmondely Creek*		VU	EN	Range restricted to one site closer to Gove
	a tree	*Intsia bijuga*		-	CR	Range restricted to one site closer to Gove
	a bladderwort	*Utricularia singeriana*		-	VU	No suitable habitat or proximate records
	Arafura Snake-eyed Skink	*Cryptoblepharus gurrmul*	Reptile	EN	EN	Restricted-range to islands in the west of the bioregion
	Mertens' Water Monitor	*Varanus mertensi*		EN	VU	Regional records, but no habitat
	Mitchell's Water Monitor	*Varanus mitchelli*		CR	VU	No nearby records and no habitat
	Oenpelli Python	Nyctophilopython oenpelliensis		-	VU	Range restricted to western Arnhem Land escarpment
	Plains Death Adder	*Acanthophis hawkei*		VU	VU	No suitable habitat and no records for the bioregion

Key: CR = Critically Endangered, CD = Conservation Dependent, EN = Endangered, VU = Vulnerable, DD = Data Deficient

Five threatened species were identified as being of concern in NT EPA Direction (Ref EP2023/031). More detail on their assessment is provided below.

5.1.1 Black-footed Tree-rat (*Mesembriomys gouldii gouldii*)

The Kimberley and mainland Northern Territory sub-species of the Black-footed Tree-rat (*Mesembriomys gouldii gouldii*) is listed as Endangered under both the *EPBC* and *TPWC Acts*. It predominantly occurs in woodlands and lowland open forests with large trees dominated by *Eucalyptus miniata* and/or *E. tetrodonta* and a moderately dense and diverse mid-storey of small trees and shrubs where the subspecies dens mostly in tree hollows but may also use clumps of *Pandanus spiralis* (DEPWS 2021). The Black-footed Tree-rat generally requires fruit and seed resources including Pandanus fruits, fruiting trees and shrubs (Rankmore 2006). Black-footed Tree-rats have a large home range (~67 ha) (Rankmore and Friend 2008).

The subspecies is thought to be more prevalent in woodlands with infrequent and low intensity fires (Price and Baker 2005) with greater fruiting species diversity to support a greater abundance of Black-Footed Tree-rat individuals (Rankmore 2006). Frequently burnt landscapes may contain fewer larger hollow-bearing trees which is an important resource for the species, whilst natural events such as cyclones may also reduce the number of trees and hence hollow availability (Woinarski and Westaway 2008). This species does not use highly modified habitat and requires forested corridors connecting remnant patches of intact woodland larger than 1 ha in size (Rankmore and Price 2004).

The field assessment found that the habitat for this species within the project area is of low quality. There are few hollow-bearing trees and/or Pandanus trees suitable for nesting and a sparse fruiting mid-storey with a low species diversity. Of the ~15 records of the Black-footed Tree-rat in east Arnhem Land in the last 10 years, none occur within 5 km of the project area, although this may be due in part to a lack of survey effort (although they were not recorded in a previous fauna survey of the area (Ecosmart 2015). For these reasons, it is concluded that the Black-footed Tree-rat has a low likelihood of occurrence in the project area.

5.1.2 Northern Brushtail Possum (*Trichosurus vulpecula arnhemensis*)

The north-western sub-species of the Brushtail Possum (*Trichosurus vulpecula arnhemensis*) is listed as Vulnerable under the *EPBC Act* and not listed under the *TPWC Act*. The Northern Brushtail Possum mainly inhabits tall eucalypt open forests and woodlands with large hollow-bearing trees, particularly where the understorey contains shrubs that bear fleshy fruits (TSSC 2021). The sub-species' abundance is associated with high shrub density (Stobo-Wilson et al. 2019).

The broadscale decline of the subspecies' populations in Australia's Top End and reduction of its distribution across the Northern Territory – an estimated 72% decrease in the species' historical geographic range in north-western Australia between 1993 and 2019 – is largely attributed to frequent extensive fires, which reduces shelter sites and shrub density, thereby increasing risk of feral cat predation, as well as habitat modification from invasive grasses, namely the African Gamba grass (*Andropogon gayanus*) and Mission grass (*Cenchrus polystachios*) (Stobo-Wilson et al. 2019; TSSC 2021).

The assessment found that the likelihood of occurrence for the Northern Brushtail Possum was low. There are no recent records for this sub-species in east Arnhem Land. The lack of nesting habitat (large hollows) or suitable foraging habitat (a dense fruiting mid-storey) also lowers the likelihood of occurrence within the project area. The monsoon vine forest patches – a significant vegetation type in the NT - to the south of the project area, may provide some habitat for the Northern Brushtail Possum. Protection of these vegetation communities are discussed further in Section 7.

5.1.3 Partridge Pigeon (*Geophaps smithii smithii*)

The Partridge Pigeon (*Geophaps smithii smithii*) is listed as Vulnerable under both the *EPBC* and *TPWC Acts.* It is a medium-sized ground dwelling bird which forages entirely on the ground and rarely flies, except when flushed. The species is largely sedentary and typically occurs singly or in small family groups. Larger aggregations may occur around waterholes. The Partridge Pigeon nests on the ground, preferentially in lowland eucalypt open forests and woodlands at sites with relatively dense grass cover. This is in contrast to the relatively open (often burnt) areas the species prefers for feeding, which suggests that fire regimes may significantly affect the species. Nesting occurs mostly in the early dry season (Woinarski 2004).

There are no recent records for this sub-species in east Arnhem Land and it is likely to be locally-extinct. The frequent, large-scale fires in the area have lowered the quality of habitat for the Partridge Pigeon, creating a more homogeneous ground cover and reducing the availability of grass species. For these reasons, this species is assessed as having a low likelihood of occurrence in the project area.

5.1.4 Fawn Antechinus (*Antechinus bellus*)

The Fawn Antechinus (*Antechinus bellus*) is listed as Vulnerable under the *EPBC Act* and Endangered under the *TPWC Act*. This species is found in the savannah woodland and tall open forest of the Top End. It shelters in tree hollows and fallen logs and appears to prefer areas exposed to less frequent and cooler fires. The species decline is likely due to predation by cats and inappropriate fire regimes affecting habitat quality. Weeds and grazing by livestock and feral animals may have reduced the availability of preferred food (DEPWS 2021).

There are no recent records for this sub-species in east Arnhem Land and it is likely to be locally-extinct. The habitat of the project area lacks tree hollows and the dense undergrowth that this species prefers and is subject to frequent fires. For these reasons, the species is assessed as having a low likelihood of occurring within the project area.

5.1.5 Northern Brush-tailed Phascogale (*Phascogale pirata*)

The Northern Brush-tailed Phascogale is listed as Vulnerable under the *EPBC Act* and as Endangered under the *TPWC Act*. The Northern Brush-tailed Phascogale is an elusive and poorly known mammal. It is an intermediate sized, hollow-dwelling, carnivorous marsupial weighing 150 to 200 g (DEPWS 2021h). The Northern Brush-tailed Phascogale is endemic and restricted to the coastal savannas in the Top End (Geyle et al. 2020). A small number of records exist, including on Melville Island from tall open Eucalypt forests (DEPWS 2021c). While few records exist, there is evidence of a decline in both population and distribution of this species across the Top End (Woinarski et al 2014). Melville Island is a stronghold for small to medium mammals and this is an important population for the species long-term survival due to species not being recorded on the mainland for more than twenty years, despite targeted survey effort (Geyle et al. 2020).

There are no recent records for this species on the mainland for the past 20 years, and it is likely to be locally-extinct. The project area habitat is assessed as low for this species as it lacks large nesting hollows and is subject to frequent fires. Therefore the Northern Brush-tailed Phascogale is assessed as having a low likelihood of occurrence.

6 MIGRATORY SPECIES

Australia is a signatory to three bilateral migratory bird agreements with Japan, China and the Republic of Korea. These agreements provide a basis for cooperation on activities for the conservation of migratory birds that move between each country. Species listed on the annexes to these agreements are a Matter of National Environmental Significance under the EPBC Act as listed migratory species.

The PMST report (see Appendix B) identified the possibility of 55 migratory species protected under international agreements occurring within the region. Of these species, 23 are threatened species that have already been assessed to have a low or no likelihood of occurring in the project area in Section 3. The remaining 22 species are all species for which there is either not appropriate habitat in the project area – for example, water-dwelling species, species requiring tidal mudflats or species requiring wetlands – or else the species utilises a range of habitats and is not dependent on the habitat in the project area. Thus, the habitat within the project area is not considered to be important habitat for any migratory species. Assuming that the project activities remain within the project area and mitigation strategies are implemented to minimise indirect impacts outside of the project area– such as sediment control to minimise indirect impacts onto the adjacent mangrove communities – migratory species are unlikely to be impacted by the proposed project.

7 SUMMARY & RECOMMENDATIONS

The assessment found that the intact vegetation of the project area is composed of an *E. tetrodonta* and *E. miniata* woodland with *L. humilis* over a *H. triticeus* ground layer. This vegetation community is relatively uniform across the project area and typical of the region. The plateau surface is subject to strong winds, cyclones, frequent fires and has shallow soils, which result in a sparse mid-storey with reduced species diversity and a dense resprouting ground story, dominated by *E. chlorostachys* and *E. tetrodonta.* A patch of monsoon vine forest – a significant vegetation community – occurred in the south of the project area. A threatened species likelihood of occurrence assessment found none of the assessed species had a high or medium likelihood of occurrence within the project area.

The following measures are recommended to lower the risk to ecological values in the project area:

- A buffer of at least 50 m be applied to the outer edge of the monsoon vine forest patches for protection, as outlined in the land clearing guidelines.
- Apply a 20 m native vegetation buffer around the plateau edge to minimise the risk of erosion.
- Undertake clearing at the during the dry season and develop a comprehensive ESCP for the life of the project.
- Any large trees (>40 cm DBH) felled during construction are placed in adjacent vegetation within the project area as habitat.

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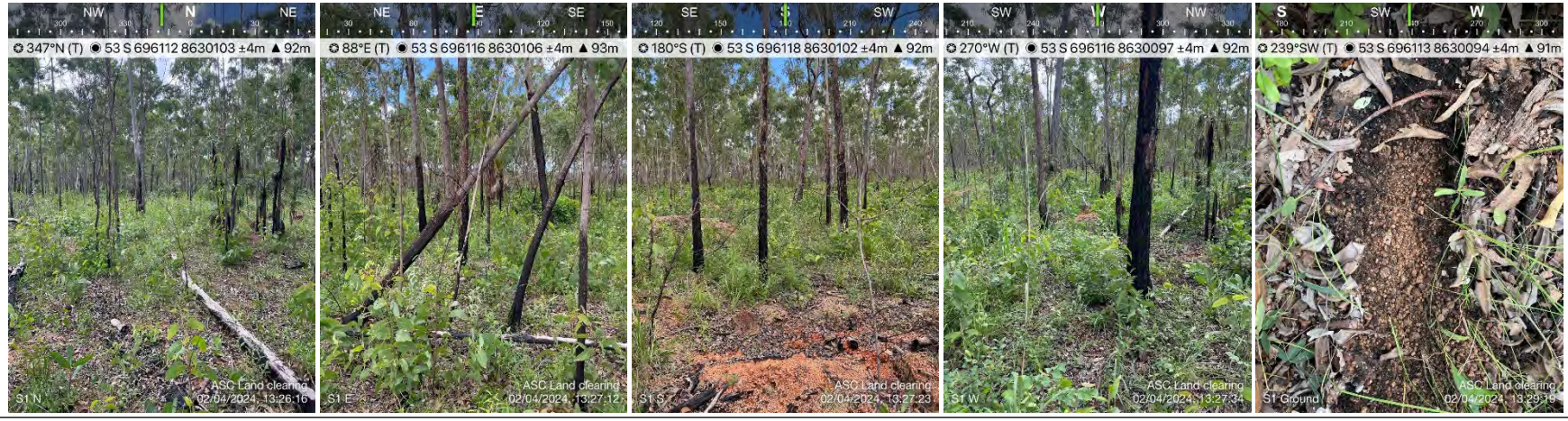
APPENDIX A VEGETATION ASSESSMENT DATA

Vegetation site	S1			Land type	1 – plateau surface	
Vegetation type	*Eucalyptus tetradonta* mid high woodland with *Eucalyptus miniata* over *E. tetradonta* and *E. minitata* high open shrubland with *Livistonia humilis*, over mid-high *Heteropogon triciceus* low sparse tussock grassland with *Erythrophloem chlorostachys* recruits.					
Landform	Very gently inclined flat plateau surface. Slope 3% with northerly aspect.					
Surface soils	Light reddish brown sandy clay loam with 60% gravel (1-30mm, ave. 2mm). Rapidly drained.			**Soil depth**	400mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	55	0	30	5	10	0
Threatening processes	Fire scars up to 3m, partially burnt logs, many *Erythrophloem chlorostachys* recruits (0.5m-1m) indictating recent fires. Isolated small borrow pits / drilling exploration pits.					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*Eucalyptus tetradonta*	10-20	14	50
	Eucalyptus miniata	8-18	12	5
Mid stratum	*Eucalyptus tetradonta*	8-10	9	10
	Eucalyptus miniata	8-10	9	10
	Livistonia humilis	1-4	2	5
	Coyrmbia sp.	6	6	1
	Brachychiton megaphyllus	1	1	1
Ground stratum	*Heteropogon triciceus*	1	1	5
	Hibbertia complanata	1-2	1	10
	Erythrophloem chlorostachys resprouts	0-1	0.5	1
	Buchanania obovata recruits			

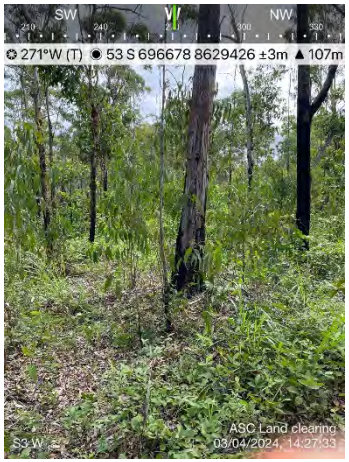


Vegetation site	S2			Land type	2 – plateau side slopes	
Vegetation type	Transitional vegetation between *E. tetrodonta* woodland and closed monsoon forest.					
Landform	Steep maximal upper slope. Slope 40% with south-westerly aspect.					
Surface soils	Brown sandy loam; 80-90% surface rocks. Very rapidly drained.			**Soil depth**	Not recorded	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	35	0	50	15	0	0
Threatening processes	None observed					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*Eucalyptus tetrodonta*	8-18	12	40
	Canarium australianum	6	6	30
Mid stratum	*Erythrophleum chlorostachys*	1-5	2	20
	Brachychiton megaphyllus	1	1	5
	Canarium australianum	2	2	5
	Diospyros maritima	5	5	5
	Pandanus spiralis	2	2	5
Ground stratum	*Heteropogon triticeus*	-	-	2
	Erythrophleum chlorostachys resprouts	-	-	20
Comment				

Vegetation site	S3			Land type	1 – plateau surface	
Vegetation type	*Eucalyptus tetrodonta* mid high open woodland with *Eucalyptus miniata* over *E. tetrodonta* and *E. miniata* high open shrubland with *Livistonia humilis*, over mid-high *Heteropogon triciceus* low sparse tussock grassland with *Erythrophloem chlorostachys* recruits.					
Landform	Very gently inclined flat: plateau surface. Slope of 3% with northerly aspect.					
Surface soils	Light reddish brown sandy clay loam with 60% gravel (10-40 mm; ave. 20 mm). Rapidly drained.			**Soil depth**	Not recorded	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	34	0	60	1	5	0
Threatening processes	Exploration drilling access tracks 20 m from assessment site.					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*Eucalyptus tetrodonta* *Eucalyptus miniata*	12-20 12	14 12	30 10
Mid stratum	*Erythrophleum chlorostachys* *E. tetrodonta* *Livistonia humilis* *E. miniata*	2 8-12 1-3 8-12	2 10 2 10	10 10 5 5
Ground stratum	*Alloteropsis semialata* *L. humilis* recruits *E. chlorostachys* resprouts	- - -	- - -	5 5 10
Comment				

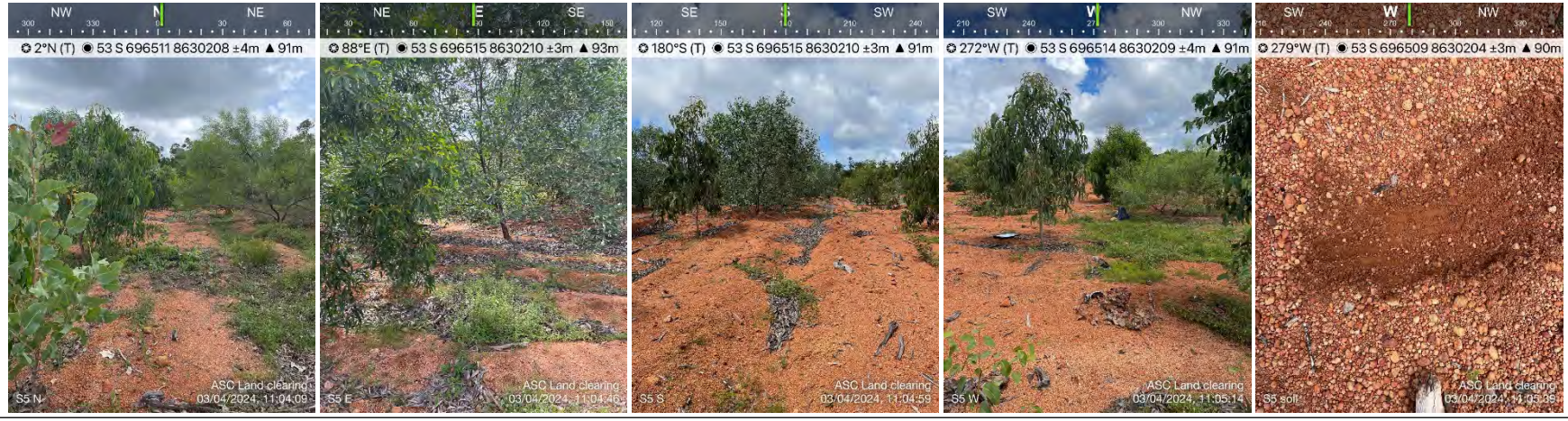


Vegetation site	S4			Land type	1 – plateau surface	
Vegetation type	Rehabilitated vegetation: *Acacia* high open shrubland with *Eucalypt* and *Corymbia* spp.					
Landform	Very gently inclined flat plateau surface. Slope <3% with northerly aspect.					
Surface soils	Light reddish brown sandy clay loam; with soil in loose trenches approx 20 cm high, running in N-S direction. Rapidly drained.			**Soil depth**	Not recorded	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	8	0	1	1	90	0
Threatening processes	None observed.					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*None*	-	-	-
Mid stratum	*Acacia spp.* *Corymbia phoenicea* *E. tetrodonta*	1-4 2 2	3 2 2	10 5 5
Ground stratum	Isolated herbs; isolated *Acacia* and *Eucalypt* recruits			
Comment				

Vegetation site	S5			Land type	1 – plateau surface	
Vegetation type	Rehabilitated vegetation: *Acacia* high open shrubland with *Eucalypt* and *Corymbia* spp.					
Landform	Very gently inclined flat plateau surface. Slope <2% with westerly aspect.					
Surface soils	Light reddish brown sandy clay loam; soil in loose trenches approx. 20 cm high and spaced 30 cm apart. Rapidly drained.			**Soil depth**	Not recorded	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	30	0	5	5	60	0
Threatening processes	None observed					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	-	-	-	-
Mid stratum	*Acacia* spp. - mix *E. tetrodonta* *E. miniata*	2-6 3-4 3	4 3 3	15 5 1
Ground stratum	*L. humilis* *E. tetrodonta*	- -	- -	5 5
Comment				

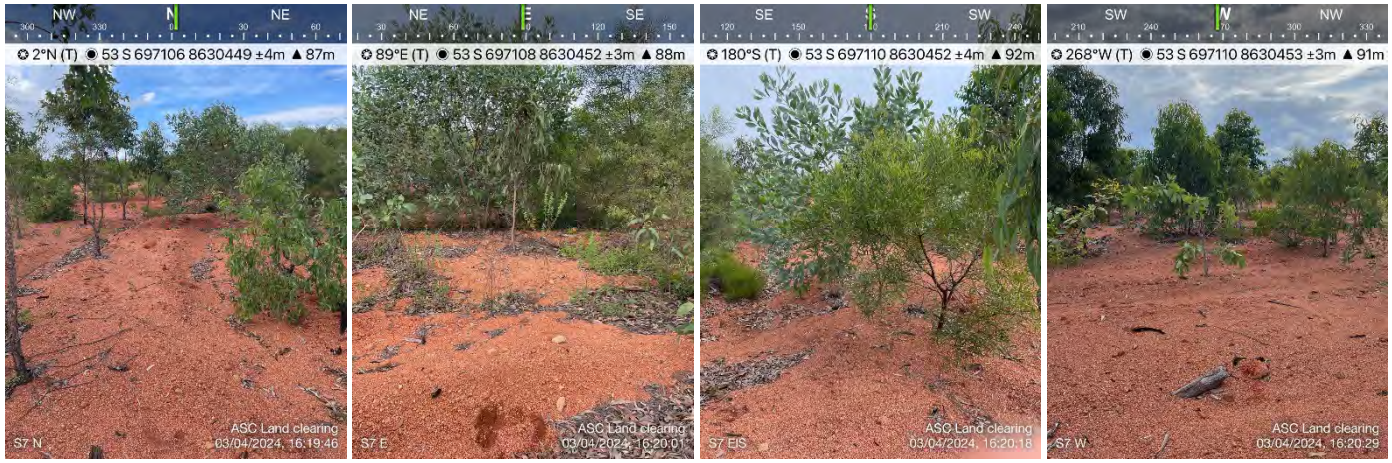


Vegetation site	S6			Land type	1 – plateau surface	
Vegetation type	*Eucalyptus tetrodonta* mid high open woodland with *Eucalyptus miniata* over *E. tetrodonta* and *E. miniata* high open shrubland with *Livistonia humilis*, over mid-high *Heteropogon triciceus* low sparse tussock grassland with *Erythrophloem chlorostachys* recruits.					
Landform	Gently inclined flat plateau surface. Slope 3-5% with northerly aspect					
Surface soils	Brown sandy clay loam; high in organic matter; 60% gravel (10-30 mm, average 20 mm). Rapidly drained.			Soil depth	>500 mm	
Ground cover (%)	Vegetation	Bare soil	Leaf litter	Rock	Gravel	Water
	33	0	25	2	40	0
Threatening processes	Minor earthworks nearby.					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*E. tetrodonta* *E. miniata*	12-20 12-18	14 12	20 20
Mid stratum	*E. tetrodonta* *E. miniata* *L. humilis* *Pandanus spiralis*	2-10 2-10 2 1	4 4 2 1	10 10 5 2
Ground stratum	*Heteropogon triticeus* *Grevillea sp.*	- -	- -	5 1
Comment				

Vegetation site	S7			Land type	1 – plateau surface	
Vegetation type	Rehabilitated vegetation: *Acacia* high open shrubland with *Eucalypt* and *Corymbia* spp.					
Landform	Very gently inclined flat plateau surface. Slope 1-3% with westerly aspect.					
Surface soils	Light reddish brown sandy clay loam; soil in loose trenches approx. 20 cm high and spaced 30 cm apart. Rapidly drained.			**Soil depth**	Not recorded	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	10	0	15	5	70	0
Threatening processes	None observed					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	-	-	-	-
Mid stratum	*Mix of Acacia* spp. including *A. multisiliqua, A. holosericea,*	3-4	3	15
	Corymbia phoenicea	3	3	1
	E. tetrodonta	2-4	3	5
	Buchanania obovata	2	2	1
	Planchonia careya	2	2	1
	Grevillea pteridifolia.	2	2	5
Ground stratum	-	-	-	-
Comment				

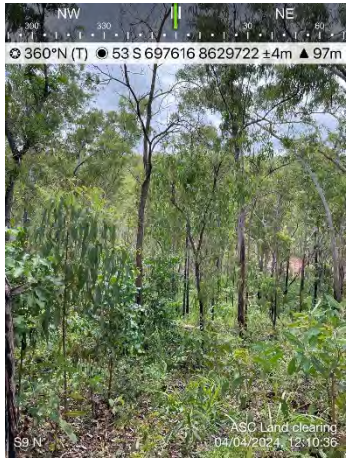


Vegetation site	S8			Land type	1 – plateau surface	
Vegetation type	Rehabilitated vegetation: *Acacia* high open shrubland with *Eucalypt* and *Corymbia* spp.					
Landform	Very gently inclined flat plateau surface. Slope 1-3% with westerly aspect. .					
Surface soils	Light reddish brown sandy clay loam. Trenches in top-soil typically 10-20cm high and 20cm apart. Rapidly drained.			Soil depth	Not recorded	
Ground cover (%)	Vegetation	Bare soil	Leaf litter	Rock	Gravel	Water
	30	0	20	5	45	0
Threatening processes	None observed					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	-	-	-	-
Mid stratum	*Grevillea pteridifolia*	4-6	3	20
	Grevillea heliosperma	3	3	5
	Acacia spp. - various	3-4	3	15
	E. tetrodonta	2-4	3	5
	B. obovata	1	1	1
Ground stratum	-	-	-	-
Comment				

Vegetation site	S9			Land type	2 – plateau side slope	
Vegetation type	*Eucalyptus tetrodonta* mid high woodland with *Eucalyptus miniata* over *Erythroploem chlorostacys* high open shrubland, over mid-high *Heteropogon triciceus* low sparse tussock grassland with *Erythrophloem chlorostachys* recruits.					
Landform	Steep maximal upper slope. Slope 45% with northerly aspect.					
Surface soils	Dark brown sandy loam with organic material present. 10% rocks 20-60 mm (average 30 mm). Very rapidly drained.			**Soil depth**	>500 mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	9	0	80	10	1	0
Threatening processes	Recent fire scars ~1 m high.					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*E. tetrodonta*	8-12	10	30
Mid stratum	*E. chlorostachys*	2-10	6	20
	B. megaphyllus	1-2	1	2
	Canarium australianum	0-2	1	2
	L. humilis	1-2	2	10
Ground stratum	*Alloteropsis semialata*	-	-	2
	H. triticeus	-	-	1
	B. obovata recruits	-	-	5
Comment	Medium height *E. chlorostachys* are dominant in mid-story here and much taller than at other sites. Two low *P. spiralis* trees noted on plateau surface nearby.			



Vegetation site	S10			Land type	1 – plateau surface	
Vegetation type	*E. tetrodonta* and *E. minitata* mid high open woodland over *E. tetrodonta* high open shrubland with *Livistonia humilis*, over mid-high *Heteropogon triticeus* low sparse tussock grassland.					
Landform	Very gently inclined flat: plateau surface. Slope 1% with south-easterly aspect.					
Surface soils	Light brown sandy clay loam; 40% rocks. Rapidly drained			**Soil depth**	Bedrock at 150 mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	20	0	30	40	10	0
Threatening processes	No recent fire scars, many recruits. Estimate fire >2 years ago at this site.					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*E. tetrodonta* *E. miniata*	12-14 10-12	13 11	20 15
Mid stratum	*E. tetrodonta* *E. miniata* *L. humilis* *B. megaphyllus* *B. obovata*	1-3 1-3 1-2 1-3 1	2 2 2 2 1	5 2 5 5 5
Ground stratum	*Alloteropsis semialata* *Heteropogon triticeus*	- -	- -	5 5
Comment				

Vegetation site	S11			Land type	1 – plateau surface	
Vegetation type	*E. tetrodonta* and *E. minitata* mid high open woodland over *E. tetrodonta* high open shrubland with *Livistonia humilis*, over mid-high *Heteropogon triticeus* low sparse tussock grassland.					
Landform	Very gently inclined flat plateau surface. Slope 3% with westerly aspect.					
Surface soils	Light reddish brown sandy loam; 30% large rocks on surface up to 500mm. Rapidly drained.			**Soil depth**	Bedrock at 250 mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	20	0	40	30	10	0
Threatening processes	Recent fire scars 1-2m (within 1 year).					
Vegetation	**Dominant species**			**Height range (m)**	**Average height (m)**	**Cover (%)**
Upper stratum	*E. tetrodonta* *E. miniata*			10-12 10-12	11 11	30 40
Mid stratum	*L. humilis* *P. spiralis*			1-3 3	2 3	10 1
Ground stratum	*A. semialata* *H. triticeus*			- -	- -	10 5
Comment	*E. miniata* slightly more dominant in this localised patch. *B. obovata* and *B. megaphyllus* absent.					

Vegetation site	S12			Land type	1 – plateau surface	
Vegetation type	*E. tetrodonta* mid high open woodlandwith *E. miniata* over *L. humilis* high open shrubland, over *H. triticeus* and *A. semialata* low sparse tussock grassland.					
Landform	Very gently inclined flat plateau surface. Slope 3% with southerly aspect.					
Surface soils	Light reddish brown sandy loam. Very few rocks. Surface gravel 5-10 mm. Rapidly drained.			**Soil depth**	Bedrock at 450 mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	28	2	10	0	60	0
Threatening processes						

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*E. tetrodonta* *E. miniata*	10-20 8-18	12 12	20 5
Mid stratum	*E. tetrodonta* *L. humilis* *B. obovata*	0-1 0-2 1	1 1 1	30 5 1
Ground stratum	*H. triticeus* *Alloteropsis semialata* *B. megaphyllus*	- - -	- - -	5 1 1
Comment	Area has been rehabilitated (Klaus Helm, pers. comms. April 2024). Evidence of large tree-felling.			

Vegetation site	S13			Land type	2 – plateau side slope	
Vegetation type	*E. tetrodonta* and *E. miniata* mid high open woodland over *E. tetrodonta* high open shrubland with *L. humilis*, over *H. triticeus* and *A. semialata* mid-high sparse tussock grassland.					
Landform	Steep simple slope. Slope 45% with westerly aspect.					
Surface soils	Brown sandy loam; 10% rocks. Very rapidly drained.			**Soil depth**	>500 mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	60	0	20	10	10	0
Threatening processes						

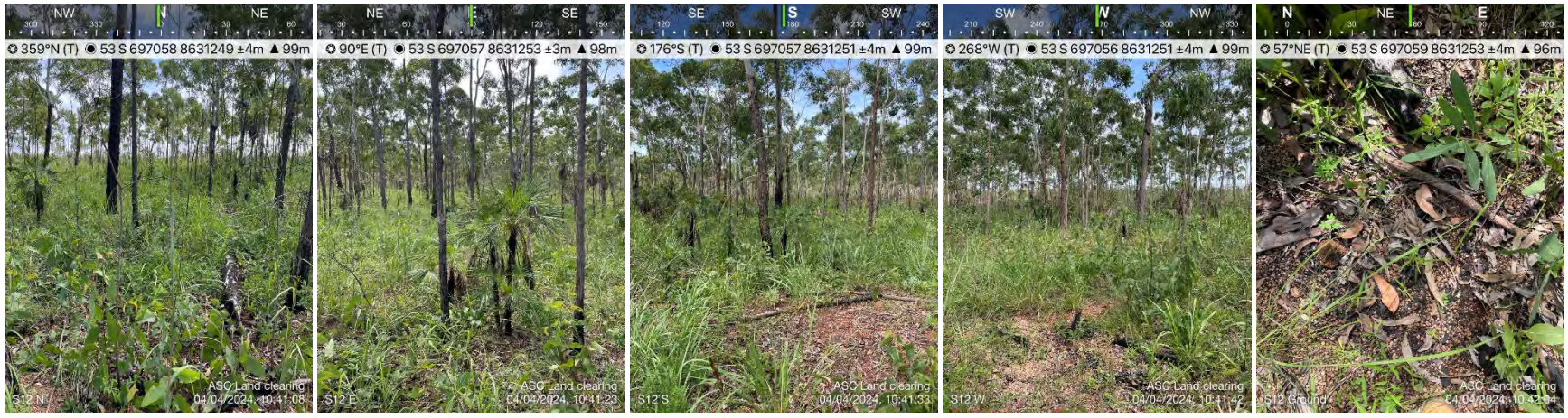
Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*E. tetrodonta*	12-20	14	45
	E. miniata	12	12	2
Mid stratum	*L. humilis*	1-3	2	10
	P. spiralis	2	2	2
	E. tetrodonta	3-10	5	5
	E. miniata	3-10	5	5
Ground stratum	*Alloteropsis semialata*	-	-	5
	H. triticeus	-	-	20
	Mnesithea rottboellioides	-	-	5
	Acacia spp.	-	-	5
	B. megaphyllus	-	-	5
Comment	Many *E. chlorostachys* resprouts			

Vegetation site	CS1 (intersection of drainage depressions)			Land type	4 – drainage depression	
Vegetation type	*E. tetrodonta* mid high open woodland over *P. spiralis, L. humilis* and *E. chlorostachys* high open shrubland.					
Landform	Very gently open depression: drainage depression. Slope <3% with north-westerly aspect.					
Surface soils	Brown sandy clay loam			**Soil depth**	>500 mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	83	5	10	0	2	0
Threatening processes	-					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	-	-	-	-
Mid stratum	-	-	-	-
Ground stratum	-	-	-	-
Comment	This site was outside of project area, at the intersection of several drainage channels and downstream of the proposed dam. Most old-growth trees in this area (approx. 6 tree between 40-50 cm diameter) have been felled. Large logs relatively common in this area. No *Melaleuca* spp. observed at this site or near by.			

Vegetation site	CS2			Land type	1 – plateau surface	
Vegetation type	*E. tetrodonta* and *E. miniata* mid high open woodland over *E. tetrodonta* high open shrubland with *L. humilis*, over *H. triticeus* and *A. semialata* Mid-high sparse tussock grassland.					
Landform	Very gently inclined flat: plateau surface. Slope 1-3% with south-westerly aspect.					
Surface soils	Light reddish brown sandy loam. Very few rocks. Surface gravel 5-10 mm. Rapidly drained.			**Soil depth**	Bedrock at 530 mm	
Ground cover (%)	**Vegetation**	**Bare soil**	**Leaf litter**	**Rock**	**Gravel**	**Water**
	-	-	-	-	-	-
Threatening processes	-					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	*E. tetrodonta* *E. miniata*	- -	- -	- -
Mid stratum	*L. humilis*	-	-	-
Ground stratum	*A. semialata* *H. triticeus*	- -	- -	- -
Comment	Very similar in structure and composition to CS2 however more dense upper and ground strata, and a less dense mid-story. Area was historically used for Woomera satellite tracking station housing and has been rehabilitated (Klaus Helm, pers. comms. April 2024).			



Vegetation site	CS3			Land type	4 – drainage depression	
Vegetation type	*E. tetrodonta* mid high open woodland with *E. miniata* over *P. spiralis, L. humilis* and *E. chlorostachys* high open shrubland. Mid-high sparse tussock grassland.					
Landform	Very gently inclined flat: plateau surface. Slope 1-3% with north-westerly aspect.					
Surface soils	Brown sandy clay loam			Soil depth	>500 mm	
Ground cover (%)	Vegetation	Bare soil	Leaf litter	Rock	Gravel	Water
	85	5	10	0	2	0
Threatening processes	-					

Vegetation	Dominant species	Height range (m)	Average height (m)	Cover (%)
Upper stratum	-	-	-	-
Mid stratum	-	-	-	-
Ground stratum	-	-	-	-
Comment	Similar to check-site CS1, which is 250m to north-west. Has high proportion of large trees in this area. No *Melaleuca* spp. observed at this site or nearby. Fallen logs common throughout area. Approximately 6 large trees felled here.			

APPENDIX B PROTECT MATTERS SEARCH TOOL (PMST) REPORT

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 23-Apr-2024

Summary

Matters of National Environment Significance

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

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	2
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	47
Listed Migratory Species:	55

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Lands:	8
Commonwealth Heritage Places:	None
Listed Marine Species:	88
Whales and Other Cetaceans:	13
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	1
Habitat Critical to the Survival of Marine Turtles:	5

Extra Information

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

State and Territory Reserves:	3
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	10
Key Ecological Features (Marine):	1
Biologically Important Areas:	11
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places [Resource Information]

Name	State	Legal Status	Buffer Status
Indigenous			
Wurrwurrwuy	NT	Listed place	In buffer area only

Commonwealth Marine Area [Resource Information]

Approval is required for a proposed activity that is located within the Commonwealth Marine Area which has, will have, or is likely to have a significant impact on the environment. Approval may be required for a proposed action taken outside a Commonwealth Marine Area but which has, may have or is likely to have a significant impact on the environment in the Commonwealth Marine Area.

Feature Name	Buffer Status
Commonwealth Marine Areas (EPBC Act)	In buffer area only
Commonwealth Marine Areas (EPBC Act)	In buffer area only

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Calidris acuminata			
Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus			
Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Calidris tenuirostris			
Great Knot [862]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
Charadrius leschenaultii			
Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Erythrotriorchis radiatus Red Goshawk [942]	Endangered	Species or species habitat known to occur within area	In feature area
Erythrura gouldiae Gouldian Finch [413]	Endangered	Species or species habitat may occur within area	In feature area
Falcunculus frontatus whitei Crested Shrike-tit (northern), Northern Shrike-tit [26013]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Endangered	Species or species habitat may occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Tyto novaehollandiae kimberli Masked Owl (northern) [26048]	Vulnerable	Species or species habitat likely to occur within area	In feature area
FISH			
Thunnus maccoyii Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat may occur within area	In buffer area only
MAMMAL			

Scientific Name	Threatened Category	Presence Text	Buffer Status
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Conilurus penicillatus Brush-tailed Rabbit-rat, Brush-tailed Tree-rat, Pakooma [132]	Vulnerable	Species or species habitat may occur within area	In feature area
Dasyurus hallucatus Northern Quoll, Digul [Gogo-Yimidir], Wijingadda [Dambimangari], Wiminji [Martu] [331]	Endangered	Species or species habitat likely to occur within area	In feature area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Mesembriomys gouldii gouldii Black-footed Tree-rat (Kimberley and mainland Northern Territory), Djintamoonga, Manbul [87618]	Endangered	Species or species habitat known to occur within area	In feature area
Notomys aquilo Northern Hopping-mouse, Woorrentinta [123]	Endangered	Species or species habitat known to occur within area	In feature area
Petrogale concinna canescens Nabarlek (Top End) [87606]	Endangered	Species or species habitat likely to occur within area	In feature area
Phascogale pirata Northern Brush-tailed Phascogale [82954]	Vulnerable	Species or species habitat may occur within area	In feature area
Saccolaimus saccolaimus nudicluniatus Bare-rumped Sheath-tailed Bat, Bare-rumped Sheathtail Bat [66889]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Trichosurus vulpecula arnhemensis Northern Brushtail Possum [83091]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Xeromys myoides Water Mouse, False Water Rat, Yirrkoo [66]	Vulnerable	Species or species habitat likely to occur within area	In feature area
PLANT			
Erythroxylum sp. Cholmondely Creek (J.R.Clarkson 9367) (Northern Territory Population) [91740]	Vulnerable	Species or species habitat known to occur within area	In feature area
REPTILE			
Acanthophis hawkei Plains Death Adder [83821]	Vulnerable	Species or species habitat may occur within area	In feature area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Tiliqua scincoides intermedia Northern Blue-tongued Skink [89838]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Varanus mertensi](#)			
Mertens' Water Monitor, Mertens's Water Monitor [1568]	Endangered	Species or species habitat known to occur within area	In feature area
SHARK			
[Carcharodon carcharias](#)			
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Glyphis garricki](#)			
Northern River Shark, New Guinea River Shark [82454]	Endangered	Species or species habitat may occur within area	In buffer area only
[Glyphis glyphis](#)			
Speartooth Shark [82453]	Critically Endangered	Species or species habitat may occur within area	In buffer area only
[Pristis clavata](#)			
Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Pristis pristis](#)			
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
[Pristis zijsron](#)			
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
[Rhincodon typus](#)			
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Sphyrna lewini](#)			
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area	In buffer area only

Listed Migratory Species			[Resource Information]
Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
[Anous stolidus](#)			
Common Noddy [825]		Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
[Calonectris leucomelas](#) Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In buffer area only
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only
[Fregata minor](#) Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
[Onychoprion anaethetus](#) Bridled Tern [82845]		Breeding known to occur within area	In buffer area only
[Phaethon lepturus](#) White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
[Sterna dougallii](#) Roseate Tern [817]		Breeding known to occur within area	In buffer area only
[Sterna sumatrana](#) Black-naped Tern [800]		Breeding known to occur within area	In buffer area only
[Sternula albifrons](#) Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Migratory Marine Species			
[Anoxypristis cuspidata](#) Narrow Sawfish, Knifetooth Sawfish [68448]		Species or species habitat known to occur within area	In buffer area only
[Balaenoptera borealis](#) Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Balaenoptera edeni](#) Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Caretta caretta Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
Crocodylus porosus Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
Dugong dugon Dugong [28]		Species or species habitat likely to occur within area	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only
Isurus paucus Longfin Mako [82947]		Species or species habitat likely to occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat likely to occur within area	In buffer area only
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Pristis clavata Dwarf Sawfish, Queensland Sawfish [68447]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area	In feature area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area	In buffer area only
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In buffer area only
Migratory Terrestrial Species			
Cecropis daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Cuculus optatus](#) Oriental Cuckoo, Horsfield's Cuckoo [86651]		Species or species habitat may occur within area	In feature area
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat may occur within area	In feature area
[Rhipidura rufifrons](#) Rufous Fantail [592]		Species or species habitat known to occur within area	In feature area
Migratory Wetlands Species			
[Acrocephalus orientalis](#) Oriental Reed-Warbler [59570]		Species or species habitat may occur within area	In feature area
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calidris canutus](#) Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Calidris tenuirostris](#) Great Knot [862]	Vulnerable	Species or species habitat likely to occur within area	In buffer area only
[Charadrius leschenaultii](#) Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area	In feature area
Glareola maldivarum Oriental Pratincole [840]		Species or species habitat may occur within area	In feature area
Limnodromus semipalmatus Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
Limosa limosa Black-tailed Godwit [845]	Endangered	Species or species habitat likely to occur within area	In buffer area only
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area
Pandion haliaetus Osprey [952]		Breeding known to occur within area	In buffer area only
Thalasseus bergii Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area	In buffer area only

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

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

Commonwealth Land Name	State	Buffer Status
Defence		
Defence - NHULUNBUY TRG DEP [70065]	NT	In buffer area only

Commonwealth Land Name	State	Buffer Status
Defence - NHULUNBUY TRG DEP [70064]	NT	In buffer area only
Defence - NHULUNBUY TRG DEP [70067]	NT	In buffer area only
Defence - NHULUNBUY TRG DEP [70066]	NT	In buffer area only
Defence - NORFORCE DEPOT - NHULUNBUY [70070]	NT	In buffer area only
Unknown		
Commonwealth Land - [71140]	NT	In feature area
Commonwealth Land - [70971]	NT	In buffer area only
Commonwealth Land - [70970]	NT	In buffer area only

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Acrocephalus orientalis Oriental Reed-Warbler [59570]		Species or species habitat may occur within area overfly marine area	In feature area
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area	In feature area
Anous stolidus Common Noddy [825]		Breeding known to occur within area	In buffer area only
Anseranas semipalmata Magpie Goose [978]		Species or species habitat may occur within area overfly marine area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris tenuirostris Great Knot [862]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In buffer area only
Calonectris leucomelas Streaked Shearwater [1077]		Species or species habitat likely to occur within area	In buffer area only
Cecropis daurica as Hirundo daurica Red-rumped Swallow [80610]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat may occur within area overfly marine area	In feature area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat known to occur within area	In feature area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Fregata ariel](#) Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat known to occur within area	In buffer area only
[Fregata minor](#) Great Frigatebird, Greater Frigatebird [1013]		Species or species habitat likely to occur within area	In buffer area only
[Glareola maldivarum](#) Oriental Pratincole [840]		Species or species habitat may occur within area overfly marine area	In feature area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area	In feature area
[Hirundo rustica](#) Barn Swallow [662]		Species or species habitat may occur within area overfly marine area	In feature area
[Limnodromus semipalmatus](#) Asian Dowitcher [843]	Vulnerable	Species or species habitat may occur within area overfly marine area	In buffer area only
[Limosa lapponica](#) Bar-tailed Godwit [844]		Species or species habitat known to occur within area	In buffer area only
[Limosa limosa](#) Black-tailed Godwit [845]	Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
[Numenius madagascariensis](#) Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Onychoprion anaethetus as Sterna anaethetus			
Bridled Tern [82845]		Breeding known to occur within area	In buffer area only
Pandion haliaetus			
Osprey [952]		Breeding known to occur within area	In buffer area only
Phaethon lepturus			
White-tailed Tropicbird [1014]		Species or species habitat may occur within area	In buffer area only
Rhipidura rufifrons			
Rufous Fantail [592]		Species or species habitat known to occur within area overfly marine area	In feature area
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area
Sterna dougallii			
Roseate Tern [817]		Breeding known to occur within area	In buffer area only
Sterna sumatrana			
Black-naped Tern [800]		Breeding known to occur within area	In buffer area only
Sternula albifrons as Sterna albifrons			
Little Tern [82849]		Species or species habitat may occur within area	In buffer area only
Thalasseus bergii as Sterna bergii			
Greater Crested Tern [83000]		Breeding known to occur within area	In buffer area only
Tringa nebularia			
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area	In buffer area only
Fish			
Campichthys tricarinatus			
Three-keel Pipefish [66192]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Choeroichthys brachysoma](#) Pacific Short-bodied Pipefish, Short-bodied Pipefish [66194]		Species or species habitat may occur within area	In buffer area only
[Choeroichthys suillus](#) Pig-snouted Pipefish [66198]		Species or species habitat may occur within area	In buffer area only
[Corythoichthys amplexus](#) Fijian Banded Pipefish, Brown-banded Pipefish [66199]		Species or species habitat may occur within area	In buffer area only
[Corythoichthys flavofasciatus](#) Reticulate Pipefish, Yellow-banded Pipefish, Network Pipefish [66200]		Species or species habitat may occur within area	In buffer area only
[Corythoichthys haematopterus](#) Reef-top Pipefish [66201]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus excisus](#) Bluestripe Pipefish, Indian Blue-stripe Pipefish, Pacific Blue-stripe Pipefish [66211]		Species or species habitat may occur within area	In buffer area only
[Doryrhamphus janssi](#) Cleaner Pipefish, Janss' Pipefish [66212]		Species or species habitat may occur within area	In buffer area only
[Festucalex cinctus](#) Girdled Pipefish [66214]		Species or species habitat may occur within area	In buffer area only
[Halicampus brocki](#) Brock's Pipefish [66219]		Species or species habitat may occur within area	In buffer area only
[Halicampus grayi](#) Mud Pipefish, Gray's Pipefish [66221]		Species or species habitat may occur within area	In buffer area only
[Halicampus spinirostris](#) Spiny-snout Pipefish [66225]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area	In buffer area only
Hippichthys cyanospilos Blue-speckled Pipefish, Blue-spotted Pipefish [66228]		Species or species habitat may occur within area	In buffer area only
Hippichthys penicillus Beady Pipefish, Steep-nosed Pipefish [66231]		Species or species habitat may occur within area	In buffer area only
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area	In buffer area only
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area	In buffer area only
Hippocampus kuda Spotted Seahorse, Yellow Seahorse [66237]		Species or species habitat may occur within area	In buffer area only
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area	In buffer area only
Hippocampus spinosissimus Hedgehog Seahorse [66239]		Species or species habitat may occur within area	In buffer area only
Micrognathus micronotopterus Tidepool Pipefish [66255]		Species or species habitat may occur within area	In buffer area only
Solegnathus hardwickii Pallid Pipehorse, Hardwick's Pipehorse [66272]		Species or species habitat may occur within area	In buffer area only
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Trachyrhamphus longirostris](#) Straightstick Pipefish, Long-nosed Pipefish, Straight Stick Pipefish [66281]		Species or species habitat may occur within area	In buffer area only
Mammal			
[Dugong dugon](#) Dugong [28]		Species or species habitat likely to occur within area	In buffer area only
Reptile			
[Aipysurus duboisii](#) Dubois' Sea Snake, Dubois' Seasnake, Reef Shallows Sea Snake [1116]		Species or species habitat may occur within area	In buffer area only
[Aipysurus laevis](#) Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area	In buffer area only
[Aipysurus mosaicus as Aipysurus eydouxii](#) Mosaic Sea Snake [87261]		Species or species habitat may occur within area	In buffer area only
[Caretta caretta](#) Loggerhead Turtle [1763]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Breeding known to occur within area	In buffer area only
[Crocodylus johnstoni](#) Freshwater Crocodile, Johnston's Crocodile, Johnstone's Crocodile [1773]		Species or species habitat may occur within area	In feature area
[Crocodylus porosus](#) Salt-water Crocodile, Estuarine Crocodile [1774]		Species or species habitat likely to occur within area	In feature area
[Dermochelys coriacea](#) Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Foraging, feeding or related behaviour known to occur within area	In buffer area only
[Eretmochelys imbricata](#) Hawksbill Turtle [1766]	Vulnerable	Breeding known to occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydrelaps darwiniensis Port Darwin Sea Snake, Black-ringed Mangrove Sea Snake [1100]		Species or species habitat may occur within area	In buffer area only
Hydrophis atriceps Black-headed Sea Snake [1101]		Species or species habitat may occur within area	In buffer area only
Hydrophis czeblukovi Fine-spined Sea Snake [59233]		Species or species habitat may occur within area	In buffer area only
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area	In buffer area only
Hydrophis hardwickii as Lapemis hardwickii Spine-bellied Sea Snake [93516]		Species or species habitat may occur within area	In buffer area only
Hydrophis inornatus Plain Sea Snake [1107]		Species or species habitat may occur within area	In buffer area only
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area	In buffer area only
Hydrophis macdowelli as Hydrophis mcdowelli MacDowell's Sea Snake, Small-headed Sea Snake, [75601]		Species or species habitat may occur within area	In buffer area only
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area	In buffer area only
Hydrophis ornatus Spotted Sea Snake, Ornate Reef Sea Snake [1111]		Species or species habitat may occur within area	In buffer area only
Hydrophis pacificus Pacific Sea Snake, Large-headed Sea Snake [1112]		Species or species habitat may occur within area	In buffer area only

Scientific Name	Threatened Category	Presence Text	Buffer Status
Hydrophis peronii as Acalyptophis peronii Horned Sea Snake [93509]		Species or species habitat may occur within area	In buffer area only
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area	In buffer area only
Hydrophis stokesii as Astrotia stokesii Stokes' Sea Snake [93510]		Species or species habitat may occur within area	In buffer area only
Hydrophis zweiffei as Enhydrina schistosa Australian Beaked Sea Snake [93514]		Species or species habitat may occur within area	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle, Pacific Ridley Turtle [1767]	Endangered	Breeding known to occur within area	In buffer area only
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area	In buffer area only
Parahydrophis mertoni Arafura Smooth Sea Snake, Northern Mangrove Sea Snake [1090]		Species or species habitat may occur within area	In buffer area only

Whales and Other Cetaceans			[Resource Information]
Current Scientific Name	Status	Type of Presence	Buffer Status
Mammal			
Balaenoptera borealis Sei Whale [34]	Vulnerable	Species or species habitat may occur within area	In buffer area only
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area	In buffer area only
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat may occur within area	In buffer area only
Balaenoptera physalus Fin Whale [37]	Vulnerable	Species or species habitat may occur within area	In buffer area only

Current Scientific Name	Status	Type of Presence	Buffer Status
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area	In buffer area only
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area	In buffer area only
Orcaella heinsohni Australian Snubfin Dolphin [81322]		Species or species habitat known to occur within area	In buffer area only
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area	In buffer area only
Pseudorca crassidens False Killer Whale [48]		Species or species habitat likely to occur within area	In buffer area only
Sousa sahulensis Australian Humpback Dolphin [87942]		Species or species habitat known to occur within area	In buffer area only
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area	In buffer area only
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area	In buffer area only
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area	In buffer area only

Australian Marine Parks [Resource Information]

Park Name	Zone & IUCN Categories	Buffer Status
Wessel	Habitat Protection Zone (IUCN IV)	In buffer area only

Habitat Critical to the Survival of Marine Turtles [Resource Information]

Scientific Name	Behaviour	Presence	Buffer Status
Aug - Sep			

Scientific Name	Behaviour	Presence	Buffer Status
Natator depressus Flatback Turtle [59257]	Nesting	Known to occur	In buffer area only
Dec - Jan			
Chelonia mydas Green Turtle [1765]	Nesting	Known to occur	In buffer area only
Dermochelys coriacea Leatherback Turtle [1768]	Nesting	Known to occur	In buffer area only
May - Jul			
Lepidochelys olivacea Olive Ridley Turtle [1767]	Nesting	Known to occur	In buffer area only
Nov - May			
Eretmochelys imbricata Hawksbill Turtle [1766]	Nesting	Known to occur	In buffer area only

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State	Buffer Status
Dhimurru	Indigenous Protected Area	NT	In feature area
Dhimurru	Indigenous Protected Area	NT	In buffer area only
Laynhapuy - Stage 1	Indigenous Protected Area	NT	In buffer area only

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Katherine to Gove Gas Pipeline Project	2012/6605	Controlled Action	Post-Approval	In buffer area only
PNG-Qld Gas Pipeline - Gove Lateral	2006/2615	Controlled Action	Completed	In buffer area only
Trans-territory Gas Pipeline	2003/1186	Controlled Action	Completed	In buffer area only
Not controlled action				
Borrow area development, Gove operations, Rio Tinto Aluminium, Nhulunbuy NT	2017/8114	Not Controlled Action	Completed	In buffer area only

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Not controlled action				
External Borrow Pit for Pond 6 South	2011/5970	Not Controlled Action	Completed	In buffer area only
GMC Dhupuma Plateau Bauxite Mine, Gove, NT	2016/7826	Not Controlled Action	Completed	In feature area
Gove Alumina Refinery Expansion	2003/1068	Not Controlled Action	Completed	In buffer area only
Not controlled action (particular manner)				
External Borrow Pit for Stage 2 Construction of Additional Waste Storage Pond 8, NT	2011/5849	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only
temporary boat disposal	2005/2281	Not Controlled Action (Particular Manner)	Post-Approval	In buffer area only

Referral decision				
Addtional , Standalone Containment Pond	2012/6347	Referral Decision	Completed	In buffer area only

Key Ecological Features [Resource Information]

Key Ecological Features are the parts of the marine ecosystem that are considered to be important for the biodiversity or ecosystem functioning and integrity of the Commonwealth Marine Area.

Name	Region	Buffer Status
Gulf of Carpentaria basin	North	In buffer area only

Biologically Important Areas [Resource Information]

Scientific Name	Behaviour	Presence	Buffer Status
Marine Turtles			
Chelonia mydas Green Turtle [1765]	Foraging	Likely to occur	In buffer area only
Chelonia mydas Green Turtle [1765]	Internesting	Likely to occur	In buffer area only
Eretmochelys imbricata Hawksbill Turtle [1766]	Internesting	Likely to occur	In buffer area only
Lepidochelys olivacea Olive Ridley Turtle [1767]	Internesting	Likely to occur	In buffer area only
Natator depressus Flatback Turtle [59257]	Internesting	Likely to occur	In buffer area only
Seabirds			

Scientific Name	Behaviour	Presence	Buffer Status
Anous stolidus Common Noddy [825]	Breeding	Known to occur	In buffer area only
Onychoprion anaethetus Bridled Tern [82845]	Breeding	Known to occur	In buffer area only
Onychoprion anaethetus Bridled Tern [82845]	Breeding (high numbers)	Known to occur	In buffer area only
Sterna dougallii Roseate Tern [817]	Breeding	Known to occur	In buffer area only
Sterna dougallii Roseate Tern [817]	Breeding (high numbers)	Known to occur	In buffer area only
Thalasseus bergii Crested Tern [83000]	Breeding	Known to occur	In buffer area only

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

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

Threatened, migratory and marine species

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

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

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

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

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

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

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

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

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

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

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