Ecological Assessment

Lot 1 DP873220, 71 Branxton Street, Greta

Prepared for

Karl Waeger C/O- HDB Planning and Design

Final / November 2017

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EXECUTIVE SUMMARY

MJD Environmental has been engaged by Karl Waeger C/O- HDB Town Planning & Design, to prepare an Ecological Assessment to accompany a rezoning application for a 42 lot residential subdivision at Lot 1 DP873220, 71 Branxton Street, Greta.

NSW Biodiversity Reforms - This assessment has been prepared with due regard to the transitional arrangements set out under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Transitional Regulations). Under Part 7 clause 27 of the Transitional Regulations, the proposal is categorised as a *pending or interim planning application* pursuant to subclause (e) as the development application has been lodged with the consent authority within 3 months of commencement of the NSW Biodiversity Reforms (25th August 2017), being before 25th November 2017. It is on this basis that the assessment aims to examine the likelihood of the proposal having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 (as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*). Preliminary assessment was also undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report has been prepared with respect to the *Lower Hunter Central Coast Regional Fauna & Flora Survey Guidelines* (LHCCREMS 2002) and the *Threatened Biodiversity Survey and Assessment Guidelines* (DEC 2004). Due to the lack of native vegetation and fauna habitat on site the survey effort undertaken was modified to suit the current site conditions.

Based on a comprehensive desktop review of threatened species databases and vegetation mapping coupled with a field validation survey, the ecological assessment found:

A total of four vegetation communities across the Site as follows:

- MU 19 Hunter Lowlands Redgum Forest (Low condition);
- Pasture with Scattered trees
- Dam and degraded creekline
- Managed landscape

No threatened flora species were detected during field surveys

Two threatened species, specifically the Little Bent-wing Bat (*Miniopterus australis*) and Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*) listed as Vulnerable under the TSC Act, were recorded on site during the field validation survey. No additional threatened species were confidently recorded within the study area.

Assessment under SEPP 44 found that no 'Potential Koala Habitat' occurs within the Site and no further assessment under SEPP 44 was required.

The ecological impact assessment considered whether the removal of vegetation and cleared areas on site would constitute a significant impact on known threatened species, populations and ecological communities from the locality such that a local extinction may occur. The assessment concluded that the proposal was unlikely to have an impact on the threatened entities assessed and therefore, from an ecological perspective, there would be no impediment to development consent being granted for subdivision of this land.

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GLOSSARY OF TERMS AND ABBREVIATIONS

Term/ Abbreviation	Meaning
BC Act	Biodiversity Conservation Act 2016
Council	Cessnock City Council
DoE	Commonwealth Department of the Environment
DPE	NSW Department of Planning and Environment
DPI Water	NSW Department of Primary Industries – Water
EP&A Act	NSW Environmental Planning and Assessment Act 1979
EPBC Act	Commonwealth Environment Protection and Biodiversity Conservation Act 1999
ha	hectare
LGA	Local Government Area
LHCCREMS	Lower Hunter Central Coast Regional Environmental Management Strategy
LLS Act	Local Land Services Act
NV Act	Native Vegetation Act 1995 (as repealed)
OEH	NSW Office of Environment and Heritage
TSC Act	NSW Threatened Species Conservation Act 1995 (as repealed)

1 Introduction

MJD Environmental has been engaged by Karl Waeger C/O- HDB Town Planning & Design, to prepare an Ecological Assessment to accompany a rezoning application for a residential subdivision at Lot 1 DP873220, 71 Branxton Street, Greta, hereafter referred to as the 'site'.(**Figure 1**).

1.1 Description of Proposal

It is proposed to rezone the site to R2 Low Density Residential commensurate with the surrounding developments. This will allow for a residential form which fits in with the characteristics of the existing subdivision pattern to the east and west, as well the future developments on the adjoining urban release areas. The design concept involves a standalone residential development accommodating approximately 42 lots capable of accommodating building envelopes above the flood levels to eliminate engineering solutions and ultimately reduce the scale of development.

Refer to **Appendix A** for a plan of the proposal.

1.2 Aims & Scope

Cessnock City Council (CCC) requires the preparation of an Ecological Assessment to consider the potential for ecological impacts to occur on the site and study area as a result of the proposal.

NSW Biodiversity Reforms - This assessment has been prepared with due regard to the transitional arrangements set out under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Transitional Regulations). Under Part 7 clause 27 of the Transitional Regulations, the proposal is categorised as a *pending or interim planning application* pursuant to subclause (e) as the development application has been lodged with the consent authority within 3 months of commencement of the NSW Biodiversity Reforms (25th August 2017), being before 25th November 2017. It is on this basis that the assessment aims to examine the likelihood of the proposal having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 (as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*). Preliminary assessment was also undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report considers a number of guiding documents, including:

- Lower Hunter Central Coast Regional Flora & Fauna Survey Guidelines (LHCCREMS 2002);
- Threatened Biodiversity Survey and Assessment: Guidelines for development and activities (DECC 2004); and
- Matters of National Environmental Significance – Significant Impact Guidelines 1.1 (DoE 2013).

The scope of this flora and fauna assessment is to:

- identify vascular plant species occurring within the site, including any threatened species listed under the TSC Act and/or EPBC Act;
- identify and map the extent of vegetation communities within the site, including any Endangered Ecological Communities (EEC) listed under the TSC Act or EPBC Act;
- identify any fauna species including; threatened and migratory species, populations or their habitats, occurring within the site and are known or likely to occur within 10 km of the Site (locality);
- assess the potential of the proposed development to have a significant impact on any threatened species, populations or ecological communities (or their habitats) identified from the site; and
- if required describe measures to be implemented to avoid, minimise, manage or monitor potential impacts of the proposal.

In addition to the survey work conducted within the site, consideration has been afforded to habitats within the site in order to appreciate the overall environmental context. This has included assessment of potential direct and indirect impacts.

1.3 Site Particulars

The following nomenclature has been used in this report (Refer to **Figure 1**):

- Study Area – Refers to lands owned by the proponent
- Site – Refers to the development area within the Study Area

Locality	Greta
Land Title	Lot 1 DP873220
LGA	Cessnock City Council
Area	Study Area: 5.85ha (approx.)
Zoning	The land is currently zoned RU2 Rural Landscape.
Boundaries	The site is bordered to the northeast by a remnant patch of native forest surrounding a rural property, with the north and south west boundaries bordered by Hollingshed St and Branxton St respectively. The Southern boundary is currently the location of extensive civil works associated with the neighbouring to be constructed residential subdivision. When complete the boundary will be the location of a major access road to the sub division. Further beyond the site boundaries, the site is situated in a semi-rural area to the north and residential areas of Greta to the south and north west.
Current Land Use	The land is currently being utilised for rural-residential and small hobby farm purposes.
Topography	The site topography is characterised by a gently sloping plain from a high point in the northern corner to a low point in the southern corner with an overall change in elevation less than 20 metres. A dam is found in the eastern corner which is located on a second order stream, that exists the site at the south eastern boundary and re-enters the site and exits the site in the southern corner.

1.4 Qualifications & Licencing

Qualifications

Field investigations and reporting were conducted by Matt Doherty (BLMC, Bush Regen Cert II, Accredited BioBanking Assessor) Adam Cavallaro (BEnv. Sc, Bush Regeneration Cert IV) and Bret Stewart (B. Sc.), Phoebe Smith (BEnv. Sc.(Hons)) of MJD Environmental Pty Ltd.

Licencing

Research was conducted under the following licences:

- NSW National Parks and Wildlife Service Scientific Investigation Licence SL101684 (Valid 28 February 2018).
- Animal Research Authority (Trim File No: 16/170) issued by NSW Department of Primary Industries (Valid 8 February 2018).
- Animal Care and Ethics Committee Certificate of Approval (Trim File No: 16/170) issued by NSW Department of Primary Industries (Valid 8 February 2019).

Figure 1 Site Location

2 Methodology

The ecological assessment has been prepared generally in accordance with:

- Lower Hunter Central Coast Regional Flora & Fauna Survey Guidelines (LHCCREMS 2002);
- Threatened Biodiversity Survey and Assessment: Guidelines for development and activities (DECC 2004); and

The flora and fauna survey techniques employed for this survey have been modified in response to the scarcity of remnant native vegetation across the study area allowing for rapid assessment of flora and fauna within the highly modified landscape.

Section 3.3 *Fauna – Altered and Disturbed Habitats* of the guidelines has guided survey works at this site and carried as summarised in Table 3.4 of the guidelines.

The techniques employed to inform this impact assessment are described in further detail below.

2.1 Desktop Assessment

Online database searches involving a 10 km buffer around the site were undertaken from the NSW Bionet Wildlife Atlas and Commonwealth Protected Matters of National Significance online search tool initially on 18 October 2017. The searches provided a current list of potentially occurring threatened flora and fauna and migratory species under both the TSC Act and EPBC Act.

2.2 Field Survey

Field surveys were undertaken on the 26th and 30th October and 2nd and 7th November 2017. The prevailing weather conditions during the survey are presented in Table 1 below.

Table 1 Prevailing Weather Conditions

Date	Min Temp (°C)	Max Temp (°C)	Rain (mm)	Wind (km/h)	Sunrise-Sunset
26th October 2017	15	29.7	0	13-20 km/h	05:32 -18:45
30th October 2017	12.6	36.2	0	13 – 31km/h	05:28 – 18:49
2nd November 2017	7.7	25.5	0	6 - 17km/h	05:25 – 18:51

Sources: http://www.bom.gov.au/climate/dwo/IDCJDW2027.latest.shtml

http://www.ga.gov.au/bin/geodesy/run/sunrisenset

2.2.1 Vegetation & Significant Flora Survey

Desktop analysis of regional mapping of the Site and its surrounds was informed by large-scale vegetation mapping projects and aerial photography, including:

- Preliminary consultation of the Lower Hunter & Central Coast Regional Environmental Management Strategy (LHCCREMS) Extant Vegetation of the Lower Hunter and Central Coast Map (NPWS 2003) to determine the broad categorisation of the Site.

Confirmation of vegetation community delineation was conducted during the recent surveys, with particular emphasis upon potential direct impact areas within the site. During the field survey confirmation of vegetation community presence and delineation was undertaken within the study area to the east of the site. The survey was augmented by employing the “Random Meander Technique” described by Cropper (1993).

Due to the disturbed nature of the majority of vegetation found within the Study area a modified vegetation survey was undertaken with the follow field survey techniques:

- Establishment of one 20 X 20m vegetation quadrat to assess species presences, distribution and abundance within nominated vegetation communities.
- Establish 6 informal transects approximately 50-100m in length. To assess vegetation heterogeneity, species richness, weed density, identify community boundaries and record species presences within the study area.

No targeted threatened flora surveys were undertaken due to the generally cleared and disturbed (pasture) nature of the site.

2.2.2 Fauna

A desktop assessment of the potential use of the site by threatened fauna species (as listed under the TSC Act and EPBC Act) identified from the vicinity was undertaken prior to the commencement of field surveys (refer to section 2.1).

Based on the vegetation survey the site is considered to represent three stratification unit and is of a simple floristic structure.

A supplementary list of fauna species observed during the site survey is provided as **Appendix 2**.

Mammals

The presence of mammals was assessed via opportunistic observations during the field survey.

Nocturnal spotlighting and call-playback surveys were conducted over two separate nights.

Avifauna

The observation of avifauna within the site was undertaken via targeted diurnal census supplemented by opportunistic observations during other diurnal fieldwork (Refer to **Figure 3**). The survey was undertaken during the afternoon being a peak activity period for birds. Incidental recordings were supplemented by incidental observations.

Nocturnal bird surveys were undertaken and detail of methods employed is outlined in below under Spotlighting and call playback survey techniques

Herpetofauna

Nocturnal listening surveys were conducted at the dam location in the north east. Frogs were identified by call. Surveys of at least 20 minutes in duration occurred at each water body and were repeated over three nights. Spotlighting searches along the water's edge were conducted on each night following listening surveys.

Opportunistic reptile searches were conducted during fauna surveys with a focus on suitable habitat areas. Known occurrences of threatened reptile species from the locality were taken into account during assessment of onsite habitat, to determine the potential for the site to support such species.

Searches in likely habitat such as among fallen timber and farming debris (corrugated iron sheets) and dilapidated structures were undertaken. These searches were carried out during peak activity periods, generally during the warmer parts of the day. Stockpiles and/ or dumped rubbish was also checked for sheltering reptiles.

Microchiropteran Bats

Microbat surveys were undertaken by recording echolocation calls using the Anabat Express Detector units set to record for a number of hours between 6pm to 6am each evening. A single unit

was deployed within the study area over three nights at a single location. Anabat units were placed, with an emphasis on those areas deemed likely to provide potential foraging and flyway sites for microbats. The location of the Anabat sites are shown in **Figure 3**.

Bat call analysis was undertaken by Dr Anna McConville of Echo Ecology who is experienced in the analysis of bat echolocation calls. Each call sequence ('pass') was assigned to one of five categories, according to the confidence with which an identification could be made, being:

- Definite - Pass identified to species level and could not be confused with another species;
- Probable - Pass identified to species level and there is a low chance of confusion with another species;
- Possible - Pass identified to species level but short duration or poor quality of the pass increases the chance of confusion with another species;
- Species group - Pass could not be identified to species level and could belong to one of two or more species. Occurs more frequently when passes are short or of poor quality; or
- Unknown - Either background 'noise' files or passes by bats which are too short and/or of poor quality to confidently identify.

Appendix 3 contains the Anabat reports with all results, whilst **Figure 3** shows the Anabat locations.

Spotlighting

Spotlighting was undertaken with the use of a Lightforce Enforcer 140mm LED (376m @ 1 LUX) hand-held spotlight and head torch whilst traversing the study area. Areas of vegetation were targeted, however, due to the lack of vegetation most isolated trees and wetlands where spotlighted and cleared/disturbed areas of land were traversed whilst spotlighting into the isolated pockets of vegetation.

A total of 2-person hours of spotlighting was conducted over three nights.

Figure 3 displays the spotlighting survey effort across the Site.

Nocturnal Call Playback

The use of pre-recorded calls of Forest Owl, and Glider species that may occur within the site and surrounding area were broadcast during the nocturnal surveys in an effort to receive a vocal response or to attract the species to the playback site. The calls were broadcast through an amplification system (25W megaphone) designed to project the sound for at least 1 km under still night conditions.

As described by Kavanagh and Peake (1993) and Debus (1995), the call of each species was broadcast for at least five minutes, followed by five minutes of listening, and stationary spotlighting. Following the final broadcast and listening, the area was spotlighted on foot. Species targeted included the Barking Owl (*Ninox connivens*) Powerful Owl (*Ninox strenua*), Masked Owl (*Tyto novaehollandiae*) and Squirrel Glider (*Petaurus norfolcensis*).

A total of two call playback sessions (two sites) were undertaken over a seven-day period. The location of the call playback sites is shown in **Figure 3**.

Secondary Indications and Incidental Observations

Opportunistic sightings of secondary indications (scratches, scats, diggings, tracks etc.) of resident fauna were noted. Such indicators included:

- Distinctive scats left by mammals;
- Scratch marks made by various types of arboreal animals;
- Nests made by various guilds of birds;

- Feeding scars on Eucalyptus trees made by Gliders;
- Whitewash, regurgitation pellets and prey remains from Owls;
- Aural recognition of bird and frog calls;
- Skeletal material of vertebrate fauna; and
- Searches for indirect evidence of fauna (such as scats, nests, burrows, hollows, tracks, and diggings).

2.2.3 Habitat Survey

An assessment of the relative habitat value present within the site was undertaken. This assessment focused primarily on the identification of specific habitat types and resources in the Site favoured by known threatened species from the locality. The assessment also considered the potential value of the Site (and surrounds) for all major guilds of native flora and fauna. Habitat assessment included:

- presence, size and types of tree hollows;
- presence of rocks, logs, caves, rocky outcrops, leaf litter, overhangs and crevices;
- vegetation complexity, structure and quality;
- presence of freshwater or estuarine aquatic habitats, noting permanency;
- connectivity to adjacent areas of habitat;
- extent and types of disturbance;
- presence of foraging opportunities such as flowering eucalypts, fruits, seeds or other nectar bearing native plants; and
- presence and abundance of various potential prey species.

Habitat assessment was based on the specific habitat requirements of each threatened fauna species in regard to home range, feeding, roosting, breeding, movement patterns and corridor requirements. Consideration was given to contributing factors including topography, soil, light and hydrology for threatened flora and assemblages.

2.3 Limitations

Limitations associated with this Ecological Assessment report are presented herewith. The limitations have been taken into account specifically in relation to threatened species assessments, results and conclusions.

In these instances, a precautionary approach has been adopted; whereby ‘assumed presence’ of known and expected threatened species, populations and ecological communities has been made where relevant and scientifically justified to ensure a holistic assessment.

Seasonality & Conditions

Threatened flora species should be surveyed within their respective flowering periods to ensure accurate identification. Surveys have been undertaken outside the flowering period of some cryptic species and in these cases the precautionary principle has been applied and the potential presence of these species has been analysed based on the presence of suitable habitat.

The flowering and fruiting plant species that attract some nomadic or migratory threatened species, often fruit or flower in cycles spanning a number of years. Furthermore, these resources might only be accessed in some areas during years when resources more accessible to threatened species fail. As a consequence, threatened species may be absent from some areas where potential habitat exists for extended periods and this might be the case for nomadic and opportunistic species.

Data Availability & Accuracy

The collated threatened flora and fauna species records provided by Bionet Atlas of NSW Wildlife are known to vary in accuracy and reliability. This is usually due to the reliability of information provided to the National Parks and Wildlife Service (NPWS) for collation and/or the need to protect specific threatened species locations. During the review of threatened species records sourced from Bionet Atlas of NSW Wildlife, consideration has been given to the date and accuracy of each threatened species record in addition to an assessment of habitat suitability within the study area.

Similarly, EPBC Protected Matters Searches provide a list of threatened species and communities that have been recorded within 10 km of the study area, or which have suitable habitat within the wider area, and are subject to the same inherent inaccuracy issues as the State derived databases.

In order to address these limitations in respect to data accuracy, threatened species records have only been used to provide a guide to the types of species that occur within the locality of the study area. Consequently, habitat assessment and the results of surveys conducted within the study area and surrounds have been used to assess the likelihood of occurrence of threatened species, populations and ecological communities to occur therein.

Figure 2 Flora Survey

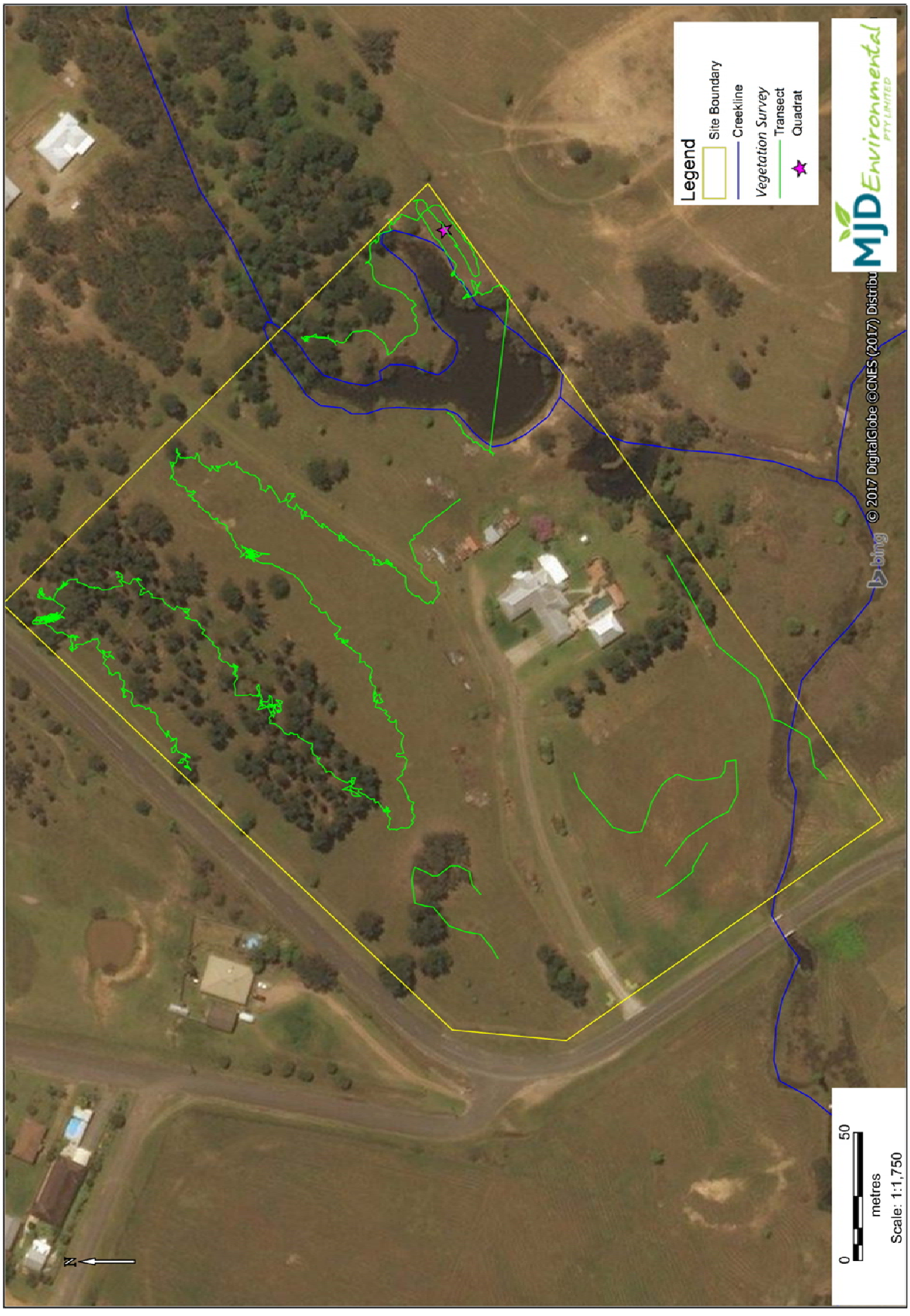


Figure 3 Fauna Survey

3 Results

3.1 Desktop Assessment

Using the NSW Wildlife Atlas database BioNet, and EPBC Act Protected Matters Search (18 October 2017), a list of potentially occurring threatened species, populations and ecological communities from the locality (10 km radius) has been compiled (**Table 2**). A total of 83 entities have been recorded of which 17 threatened flora species, 48 fauna species, 4 ecological communities and 14 migratory species have either been detected or have the potential to occur within the locality.

Note: Included in **Table 2** below are the numbers of records (not the number of individuals) for each species within the locality taken from the NSW Wildlife Atlas database. The EPBC Act Protected Matters Search does not provide number of records within the locality. Therefore, the record count related only to those TSC Act listed species that were detected within 10 km of the site. It is also noted that due to the terrestrial nature of the site, marine species were not considered under this ecological assessment and have not been included in the list.

Table 2 Threatened Flora & Fauna Database Search Results.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Flora					
Heath Wrinklewort	*Rutidosis heterogama*	V	V	1	Recorded within 10km of the site[1] Species or species habitat likely to occur within area[2]
Bynoe's Wattle	*Acacia bynoeana*	E	V	6	Recorded within 10km of the site[1] Species or species habitat known to occur within area[2]
	Asterolasia elegans	E	E	-	Species of species habitat may occur within area[2]
Netted Bottle Brush	*Callistemon linearifolius*	V		1	Recorded within 10km of the site[1]
Bluegrass	*Dichanthium setosum*	V	V	-	Species or species habitat likely to occur within area[2]
Eucalyptus camaldulensis population in the Hunter Catchment	*Eucalyptus camaldulensis*	E		1	Recorded within 10km of the site[1]
Slaty Red Gum	*Eucalyptus glaucina*	V	V	58	Recorded within 10km of the site[1] Species or species habitat likely to occur within area[2]
Earp's Gum	*Eucalyptus parramattensis* subsp. *decadens*	V	V	3	Recorded within 10km of the site[1] Species or species habitat known to occur within area[2]

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Cymbidium canaliculatum population in the Hunter Catchment	*Cymbidium canaliculatum*	E		2	Recorded within 10km of the site[1]
Small-flower Grevillea	*Grevillea parviflora* subsp. *parviflora*	V	V	1	Recorded within 10km of the site[1] Species or species habitat likely to occur within area[2]
North Rothbury Persoonia	*Persoonia pauciflora*	E	CE	91	Recorded within 10km of the site[1] Species or species habitat known to occur within area[2]
Illawarra Greenhood	*Pterostylis gibbosa*	V	E	1	Recorded within 10km of the site[1] Species of species habitat may occur within area[2]
	Euphrasia arguta	CE	CE	-	Species or species habitat may occur within area[2]
Austral Toadflax	*Thesium australe*	V	V	-	Species or species habitat may occur within area[2]
Leek Orchid	*Prasophyllum sp.* Wybong		CE	-	Species or species habitat may occur within area[2]
Heath Wrinklewort	*Rutidosis heterogama*	V	V	-	Species or species habitat likely to occur within area[2]
Magenta Lilly Pilly	*Syzygium paniculatum*	E	V	1	Recorded within 10km of the site[1] Species or species habitat may occur within area[2]
Birds					
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	1	Recorded within 10km of the site[1] Species or species habitat known to occur within area[2]
Australasian Bittern	*Botaurus poiciloptilus*	E	E	-	Species or species habitat known to occur within area[2]
Curlew Sandpiper	*Calidris ferruginea*	E	CE, M	-	Species or species habitat may occur within area[2]

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V		3	Recorded within 10km of the site[1]
Speckled Warbler	*Chthonicola sagittata*	V		11	Recorded within 10km of the site[1]
Spotted Harrier	*Circus assimilis*	V		1	Recorded within 10km of the site[1]
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V		2	Recorded within 10km of the site[1]
Varied Sittella	*Daphoenositta chrysoptera*	V		8	Recorded within 10km of the site[1]
Eastern Bristlebird	*Dasyornis brachypterus*	E	E	-	Species or species habitat likely to occur within area[2]
Black-necked Stork	*Ephippiorhynchus asiaticus*	E		1	Recorded within 10km of the site[1]
Red Goshawk	*Erythrotriorchis radiatus*	CE	V	-	Species or species habitat likely to occur within area[2]
White-fronted Chat	*Epthianura albifrons*	V		1	Recorded within 10km of the site[1]
Black Falcon	*Falco subniger*	V		1	Recorded within 10km of the site[1]
Little Lorikeet	*Glossopsitta pusilla*	V		4	Recorded within 10km of the site[1]
Painted Honeyeater	*Grantiella picta*	V	V	1	Recorded within 10km of the site[1] Species or species habitat likely to occur within area[2]
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	M	1	Recorded within 10km of the site[1]
Little Eagle	*Hieraaetus morphnoides*	V		1	Recorded within 10km of the site[1]
Swift Parrot	*Lathamus discolor*	E	CE	50	Recorded within 10km of the site[1] Species or species habitat known to occur within area[2]
Square-tailed Kite	*Lophoictinia isura*	V		1	Recorded within 10km of the site[1]
Turquoise Parrot	*Neophema pulchella*	V		1	Recorded within 10km of the site[1]
Barking Owl	*Ninox connivens*	V		1	Recorded within 10km of the site[1]
Powerful Owl	*Ninox strenua*	V		1	Recorded within 10km of the site[1]
Far Eastern Curlew	*Numenius madagascariensis*		CE, M	-	Species or species habitat may occur within area[2]
Scarlet Robin	*Petroica boodang*	V		2	Recorded within 10km of the site[1]

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V		62	Recorded within 10km of the site[1]
Australian Painted Snipe	*Rostratula australis*	E	E	-	Recorded within 10km of the site[1] Species or species habitat may occur within area[2]
Masked Owl	*Tyto novaehollandiae*	V		1	Recorded within 10km of the site[1]
Mammals					
Spotted-tailed Quoll (SE mainland population)	*Dasyurus maculatus maculatus* (southeastern mainland population)	V	E	7	Recorded within 10km of the site[1] Species or species habitat likely to occur within area[2]
Koala	*Phascolarctos cinereus*	V	V	3	Recorded within 10km of the site[1] Species or species habitat known to occur within area[2]
Eastern Pygmy-possum	*Cercartetus nanus*	V		1	Recorded within 10km of the site[1]
Squirrel Glider	*Petaurus norfolcensis*	V		16	Recorded within 10km of the site[1]
Greater Glider	*Petauroides volans*		V	-	Species or species habitat may occur within area[2]
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	-	Species or species habitat may occur within area[2]
Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	V	V	-	Species or species habitat may occur within area[2]
New Holland Mouse	*Pseudomoys novaehollandiae*		V	-	Species or species habitat likely to occur within area[2]
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	11	Recorded within 10km of the site[1] Foraging, feeding or related behaviour known to occur within area[2]
Eastern Freetail-bat	*Mormopterus norfolkensis*	V		14	Recorded within 10km of the site[1]
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	1	Recorded within 10km of the site[1] Species or species habitat

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
					likely to occur within area[2]
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V		1	Recorded within 10km of the site[1]
Little Bentwing-bat	*Miniopterus australis*	V		10	Recorded within 10km of the site[1]
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	V		26	Recorded within 10km of the site[1]
Southern Myotis	*Myotis macropus*	V		6	Recorded within 10km of the site[1]
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V		3	Recorded within 10km of the site[1]
Eastern Cave Bat	*Vespadelus troughtoni*	V		1	Recorded within 10km of the site[1]
Herpetofauna					
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	1	Species or species habitat known to occur within area[2]
Green and Golden Bell Frog	*Litoria aurea*	E	V	-	Species or species habitat likely to occur within area[2]
Stuttering Frog	*Mixophyes balbus*	E	V	-	Species or species habitat likely to occur within area[2]
Threatened Ecological Communities					
Central Hunter Valley Eucalypt Forest and Woodland Corresponds to Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregion (MU 18 – LHCCREMS)		E	CE	-	Community likely to occur in the area[2]
Hunter Valley Weeping Myall (*Acacia Pendula*) Woodland		E	CE	-	Community may occur in the area[2]
Lowland Rainforest of Subtropical Australia		E	CE	-	Community likely to occur in the area[2]
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		E	CE	-	Community likely to occur in the area[2]
Migratory Species					
Oriental Cuckoo	*Cuculus optatus*		M	-	Species or species habitat may occur within area[2]
Spectacled Monarch	*Monarcha trivirgatus*		M	-	Species or species habitat may occur within area[2]
Black-faced Monarch	*Monarcha melanopsis*		M	-	Species or species habitat known to occur within area[2]
Fork-tailed Swift	*Apus pacificus*		M	-	Species or species habitat

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Notes & Source
					likely to occur within area[2]
White-throated Needletail	*Hirundapus caudacutus*		M	-	Species or species habitat known to occur within area[2]
Yellow Wagtail	*Motacilla flava*		M	-	Species or species habitat may occur within area[2]
Satin Flycatcher	*Myiagra cyanoleuca*		M	-	Species or species habitat known to occur within area[2]
Rufous Fantail	*Rhipidura rufifrons*		M	-	Species or species habitat known to occur within area[2]
Common Sandpiper	*Actitis hypoleucos*		M	-	Speceis or species habitat may occur
Sharp-tailed Sandpiper	*Calidris acuminate*		M	-	Species or species habitat may occur within area[2]
Pectoral Sandpiper	*Calidris melanotos*		M	-	Speceis or species habitat may occur within area[2]
Latham's Snipe	*Gallinago hardwickii*		M	-	Speceis or species habitat may occur within area[2]
Osprey	*Pandion haliaetus*	V	M	-	Species or species habitat likely to occur within area[2]
Common Greenshank	*Tringa nebularia*		M	-	Species or species habitat may occur within area[2]

Key:

V = Vulnerable
M = Migratory
E = Endangered
CE = Critically Endangered

1 - *Atlas of NSW Wildlife*, Office of Environment and Heritage (Accessed 18-10-2017).
2 - Commonwealth Protected Matters Search Tool, Department of the Environment (Accessed 18-10-2017)

3.2 Flora Survey

3.2.1 Vegetation Mapping & Delineation

The vegetation communities within the study area were observed to be significantly modified as a result of previous clearing and grazing activities given the areas agricultural history. As such floristic complexity of the vegetation communities delineated within the study area was observed to be low. These communities were found to be largely devoid of a native canopy and the shrub layer often sparse. The groundcover included many exotic and/or pasture species with areas of native groundcovers.

Regional vegetation mapping identified the following two vegetation communities within the study area;

- MU17 Lower Hunter Spotted Gum-Ironbark Forest; and
- MU19 Hunter Lowlands Redgum Forest

The site assessment revealed that there is a low condition form of MU19 present around the dam and creekline in the north of the site. Whilst there was no evidence of MU17 on site.

A total of four vegetation communities have been delineated within the site these being:

- MU 19 Hunter Lowlands Redgum Forest (Low condition);
- Pasture with Scattered trees;
- Dam and degraded creekline; and
- Managed landscape.

Approximate areas of vegetation communities delineated on site have been provided in **Table 3** below. Refer to **Figure 4**.

MU19 – Hunter Lowlands Redgum Forest

The Hunter Lowlands Redgum Forest is found primarily within the top eastern corner of the site, with a very small occurrence as an isolated degraded patch adjacent to the western boundary. The areas in which this community has been identified are generally low in quality with the canopy and midstorey layers significantly altered and a groundcover layer either grazed and or competing with exotic groundcover species.

The patch in the north is found on the northern and eastern side of the dam/creekline. The vegetation on site is contiguous from adjacent vegetation on the neighbouring landholding. Native canopy is generally absent across the area with canopy species *Angophora floribunda* (Rough-barked Apple) found along the eastern margin of the dam, and *Eucalyptus tereticornis* (Forest Red Gum) scattered north of the dam. The Swamp Oak *Casuarina glauca* is found on the northern boundary at the point the creek enters the site. Other species found within the canopy layer are exotic species such as the *Grevillea robusta* (Silky Oak), *Pinus radiata* (Radiata Pine). The mid-storey is generally absent with only scattered native species present on the eastern side of the dam these species are *Pittosporum undulatum* (Sweet Pittosporum) *Ozothamnus diosmifolius* (White Dogwood) and *Breynia oblongifolia* (Coffee Bush). The remaining species in the midstorey are exotic species such as *Cinnamomum camphora* (Camphor Laurel), *Ligustrum sinense* (Small-leaf Privet), *Ligustrum lucidum* (Broad-leaf Privet), *Olea europaea* subsp *cuspidata* (African Olive) and *Lantana camara* (Lantana).

The Groundcover present within this vegetation is a mix of exotic and native species that have been routinely grazed. The groundcover often consists of grazed shrub species such as *Lissanthe strigosa* (Peach Heath), *B. oblongifolia,* and *Jacksonia scoparia* (Dogwood) and grassy and herbaceous species such as *Themeda triandra* (Kangaroo grass), *Cymbopogon refractus* (Barbed wire grass), *Rytidosperma bipartitum* (Wallaby Grass) *Eragrostis* brownii (Brown's Lovegrass) and *Imperata cylindrica* (Blady grass). The exotic weed presence in the groundcover layer is primarily grassy weeds such *Paspalum dilatatum* (Paspalum), *Andropogon virginicus* (Whisky grass), with herbs and vines

such as *Verbena bonariensis* (Purple Top), *Senecio madagascariensis* (Fireweed) and *Lonicera japonica* (Japanese Honeysuckle).

The small patch (430m^2 in area) adjacent to the western boundary has young *E. tereticornis* canopy with very sparse midstorey and groundlayer. The linear patch has been impacted by the surrounding exotic pastures with exotic species found throughout the groundcover layer. The Midstorey is primary scattered *B. oblongifolia, Acacia parvipinnula,* and *Denhamia silvestris.* The ground layer is often sparse with clusters of native and exotic species present these species include *Lomandra filiformis, Einadia hastata* (Berry Saltbush) and exotic species juvenile *Cestrum parqui* (Green Cestrum), *S. madagascariensis, Briza major* and *Verbena rigida* (Creeping Verbena).

Plate 1: Low condition Hunter Lowland Red Gum Forest

Pasture with Scattered Trees

The majority of the study area is a mix of exotic/native pasture with patches of scattered trees. The western section of the site has an established Pine plantation, with an exotic and native groundcover. The dominant grass species within this area and across the site is *Cynodon dactylon* (Couch Grass). The understorey was often dead or showing signs of stress possibly due to dry spring conditions experience in the region. In areas that allowed midstorey growth a very limited occurrence of shrubs were present. Species such as *B. oblongifolia, A. parvipinnula,* with exotic species such as *G. robusta,* and *O. europaea* subsp. *cuspidata.*

Pasture found south of the central track and south west of the pine plantation is primarily exotic pasture with scattered occurrences of native grasses. The pasture is predominantly *C. dactylon,* with *Axonopus fissifolius* (Carpet Grass), *Pennisetum clandestine* (Kikuyu), *P. dilatatum* and a number of annual grass species. Whilst there are scattered native species such as *Aristida ramosa* (Three-awned grass), *E. brownii* and *T. triandra* at no point where the native species dominant or consistent to identify these areas as native pasture. In addition, the ground layer included many common exotic herbaceous species such as *Cirsium vulgare* (Spear Thistle), *Plantago lanceolata, Senecio madagascariensis* with scattered patches of *opuntia stricta* (Prickly pear).

The areas of pasture located between the Pine plantation and northern fenceline and the area between the plantation on the central vehicle track, the presences of native species is more prevalent and species richness does increase. These areas are still primarily Couch grass dominant, but also include previous mentioned native grass species at a higher density with the addition of the following species, *Lomandra filiformis, Cheilanthes sieberi Tricoryne elatior, Rytidosperma bipartitum, Pseudognaphalium luteo-album.*

Plate 2: Pasture with Scattered trees

Dam and Degraded Creekline

The creekline that enters the landholding from the northern boundary has been heavily modified due to past and present land uses. The water course is a second order stream with a constructed on line dam in the northern corner of the site. The location of the dam on line has resulted in the edges of surrounding vegetation (HLLRGF) progressively being eroded away creating a drop off around the edge of the creek line/dam in this area. At the edges of the drop off the establishment of wetland macrophytes has occurred. The creation of a wetland like environment has provide opportunity for *Typha orientalis* to establish in the channel and around the edges of the dam. This species is found in dense patches in the narrow channel as well as scattered in patches along all edges. The wetland environment also provides opportunity for other macrophytes such *as Persicaria decipiens, Ludwigia peploides, Juncus usitatus* and *Cypress polystachyos.*

The dam has a small number of juvenile canopy species present with *C. glauca* the main species and the exotic species *Salix babylonica* (Willow) and *P. radiata*.

The dam restricts movement of water further down stream. At the time of field surveys civil works associated with the neighbouring subdivision had occurred within the creekline just below the dam (within the study area) resulting in the removal of all vegetation to allow for the construction of a bridge and road alignment.

The creekline traverses the southern corner of the site. In this location the watercourse is highly degraded with high densities of the exotic sedge species *Junucs acutus* observed. The presence of other native species, similar to those observed around the dam are low in density amongst the *J. acutus*. The creekline vegetation is primarily devoid of other riparian vegetation with pasture vegetation growing to the creek edge.

Plate 3: Dam Vegetation

Managed landscape

Vegetation adjoining the residential dwelling and associated structures consists primarily of managed exotic lawns, and garden beds with ornamental shrubs. The southern side of the residential block has a small number of native Eucalypt species inter mixed with the ornamental shrub and tree species.

Table 3 Vegetation Community Areas

Vegetation Community	Status	Area Ha (approx.)
Hunter Lowlands Red Gum Forest	*Low condition*	0.397ha
Pasture with Scattered trees	*N/A*	4.09ha
Dam and degraded creekline (Inc. civil works)	*Low condition*	0.478ha
Managed Landscape	*N/A*	0.894ha

3.2.2 Significant Flora Survey

A total of 65 flora species have been positively identified within the site during current surveys (see **Appendix 2**).

An assessment of potential habitat was undertaken for possible threatened flora species whilst traversing the site. No significant flora or potential habitat for these species listed under the TSC Act or EPBC Act were identified within the site during this ecological assessment.

3.3 Fauna Survey

The following provides the fauna results from the site survey. A total of 46 fauna species were observed during the survey period. A full list of the fauna species recorded within the site is provided as **Appendix 2**.

3.3.1 Mammals

One native mammal species was recorded during diurnal surveys across the site, being Eastern Grey Kangaroo. Along with sightings of individuals foraging, scats were observed across the site. Additionally, the Grey-headed Flying Fox (*Pteropus poliocephalus*) was observed foraging on *Grevillea robusta* during nocturnal surveys

Goats were observed grazing in the lower paddocks on sites. One European Red Fox was recorded during nocturnal spotlighting surveys.

3.3.2 Avifauna

A total of 30 bird species were recorded during the survey. Species recorded were typical of agricultural and rural settings including Eastern Rosella, Australia Raven, and Masked Lapwings.

The dam and creek line in the north-east corner of the site was the location of most of the bird activity on site. There was a small number of wetland birds observed using the dam and associated vegetation. Species observed in this area included Australian Wood Ducks, White-necked Herons, Purple Moorhens and Reed warblers.

The minimum canopy and shrub species across the site has limited the species richness within the site. In addition to the common species mentioned above there where a small number of forest and woodland birds on site, these were Superb Fairy Wren, Australian Magpies, Black-faced Cuckoo-shrike, Red Brow Finches and a family of Blue-faced Honeyeaters within the Pine tree plantation.

Also noteworthy is the high number of exotic bird species recorded on site, including Common Starlings, Indian Mynas. This reflects the high level of disturbance currently existing in the wider region, with extensive urban areas located to the north east and south east of the site in the greater Greta -Branxton area.

While the potential for threatened avifauna to occur intermittently on site cannot be discounted (particularly due to neighbouring woodland vegetation), the site lacks habitat features that could support a local population of any threatened species occurring in the region.

3.3.3 Microchiropteran Bats

A total of six microbat species were detected via the use of the Anabat SD-1 echo-location call recorder. Of these species, two are listed as Vulnerable under the TSC Act, specifically the Little Bent-wing Bat (*Miniopterus australis*) and Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*). The four remaining microbats positively identified were the Gould's Wattled Bat (*Chalinolobus gouldii*), White-striped Free-tailed Bat (*Austronomus australis*), Southern Freetail Bat (*Mormopterus planiceps)* and Inland Broad-nosed Bat (*Scotorepens balstoni*).

Additionally, the following bat species had potential to occur within the site, but could not be confidently identified:

- Chocolate Wattled Bat (*Chalinolobus morio*)
- Eastern Coastal Free-tailed Bat (*Mormopterus norfolkensis*)
- Ride's Free-tailed Bat (*Mormopterus ridei*)
- Eastern Falsistrelle (*Falsistrellus tasmaniensis*) (Vulnerable under the BC Act);
- Greater Broad-nosed Bat (*Scoteanax rueppellii*)
- Eastern Broad-nosed Bat (*Scotorepens orion*)
- Large Forest Bat (*Vespadelus darlingtoni*);
- Eastern Forest Bat (*Vespadelus* pumilus);
- Southern Forest Bat (*Vespadelus regulus*);
- Eastern Cave Bat (*Vespadelus troughtoni*) (Vulnerable under the BC Act) and
- Little Forest Bat (*Vespadelus vulturnus*)

Refer to **Appendix 2** for a detailed list of recorded species and **Appendix 3** for the Anabat Call Recording reports.

3.3.4 Herpetofauna

Seven species of herpetofauna were recorded during the survey. Over two nights of listening surveys at three separate wetlands (one farm dam and two floodplain swamps), four frog species were heard calling, namely the Common Eastern Froglet (*Crinia signifera*), Stripped Marsh Frog (*Limnodynastes peronii*), Eastern Dwarf Tree frog (*Litoria fallax*), Peron's Tree frog (*Litoria peronii*) and the Broad-palmed frog (*Litoria latopalmata*). All species were heard calling at the dam and creek line in the north east of the site.

Only two reptiles where observed during field surveys. The Red bellied black snake (*Pseudechis* porphyriacus) was observed in the vicinity of the dam during diurnal field surveys while a long-necked turtle (*Chelodina longicollis*) was observed in the dam during nocturnal survey works.

3.4 Habitat Survey

The majority of the study area exists in a highly disturbed state that is devoid of a canopy and shrub layer and contains a groundcover that is predominantly pasture that is actively grazed. There are areas of canopy trees primarily adjacent to the existing dam on site and a patch of Pine trees that have been planted in a plantation like arrangement.

Only a small number of native paddock trees remain in pasture areas and native trees in the low conditions remnants are generally young in age with one to two age cohorts present. As a result, available habitat is considered to be limited to foraging habitat for fauna species. Habitat for flora species is also limited to low condition remnants that support low species richness and a simple structure for the associated vegetation community.

Terrestrial Habitat

Habitat within the study area for terrestrial fauna species is limited as a result of the sparse to absent canopy and shrub layer observed on site. Habitat for reptile species in the form of fallen logs and/or leaf litter is limited to scattered old fence posts, old farm structures, fallen logs and other detritus beneath the scattered pasture trees. The vegetated watercourse and dam at the northern and southern edge of the study area provide habitat for frog species, with tussocks of dense *Juncus usitatus* and *J. acutus* scattered along the creekline and dam edge as well as tall macrophytes such as Typha.

The highly disturbed nature of the cleared areas limits their potential to provide habitat for terrestrial species, but some common grassland/open woodland species, including the Eastern Rosella, Willy Wagtail, Welcome Swallow, and Australian Magpie, were identified. Eastern Grey Kangaroos were seen grazing on pasture grasses on several occasions.

Arboreal Habitats

The site has very limited native canopy vegetation. Only a small number of native tree and shrub species, remain scattered through the pasture and low condition Hunter Lowlands Red Gum Forest. The Red Gum and Angophora species remaining on site do not contain hollows which limits the opportunity to support some microbats or nesting birds that rely on this habitat feature to breed and roost. Seasonal flowering events of these Red Gums and Angophora species could intermittently bring nectivores such as honeyeaters or lorikeets to the site. The *Grevillea robusta* although not native to the area was observed to be providing significant foraging opportunuities for honeyeaters, and of an evening Grey-headed Flying-fox where observed to be foraging on this species that where located adjacent to the dam.

The site has limited connectivity in the south and although is contiguous with adjacent vegetation to the north, that is part of a larger patch of vegetation, it is relatively isolated from other patches of vegetation limiting the usage potentially to highly mobile fauna species only. The distance between trees on site would allow for arboreal species such as gliders to move through the landscape but the site does not provide sufficient suitable nesting hollows and also limited foraging potential.

Aquatic Habitats

The study area contains a large dam and associated creekline, both of which are outside the development footprint. Despite the low-quality condition of the dam and creekline, they were found to support ducks (Australian Wood Duck, Pacific Black Duck), wading Pelicaniformes (White-faced Heron, Royal Spoonbill), Long necked Turtle, and five species of frogs (*Crinia signifera* and *Litoria falaxa L. latopalmata*). The vegetation within the dam particularly the Typha was observed to be providing habitat for a small number of Reed warblers, and Swamp Hens. A Red-bellied Black snake was also observed to be basking in the sun adjacent to macrophytes on the bank of the dam.

Connectivity

Habitat connectivity is generally poor within the site, as the vegetation in the north-eastern corner being the southern extent of the vegetation corridor in the locality. The Site does adjoin a larger patch of vegetation to the north, of which some is currently being removed with the neighbouring development. The substantial patch of vegetation provides connection from the site to the Hunter river, providing opportunity as a patchy corridor for fauna movement. The proposal will not reduce the connectivity in the area as native vegetation that makes up the southern extent of the corridor, albeit tenuous, will be retained.

Figure 4 Vegetation Map

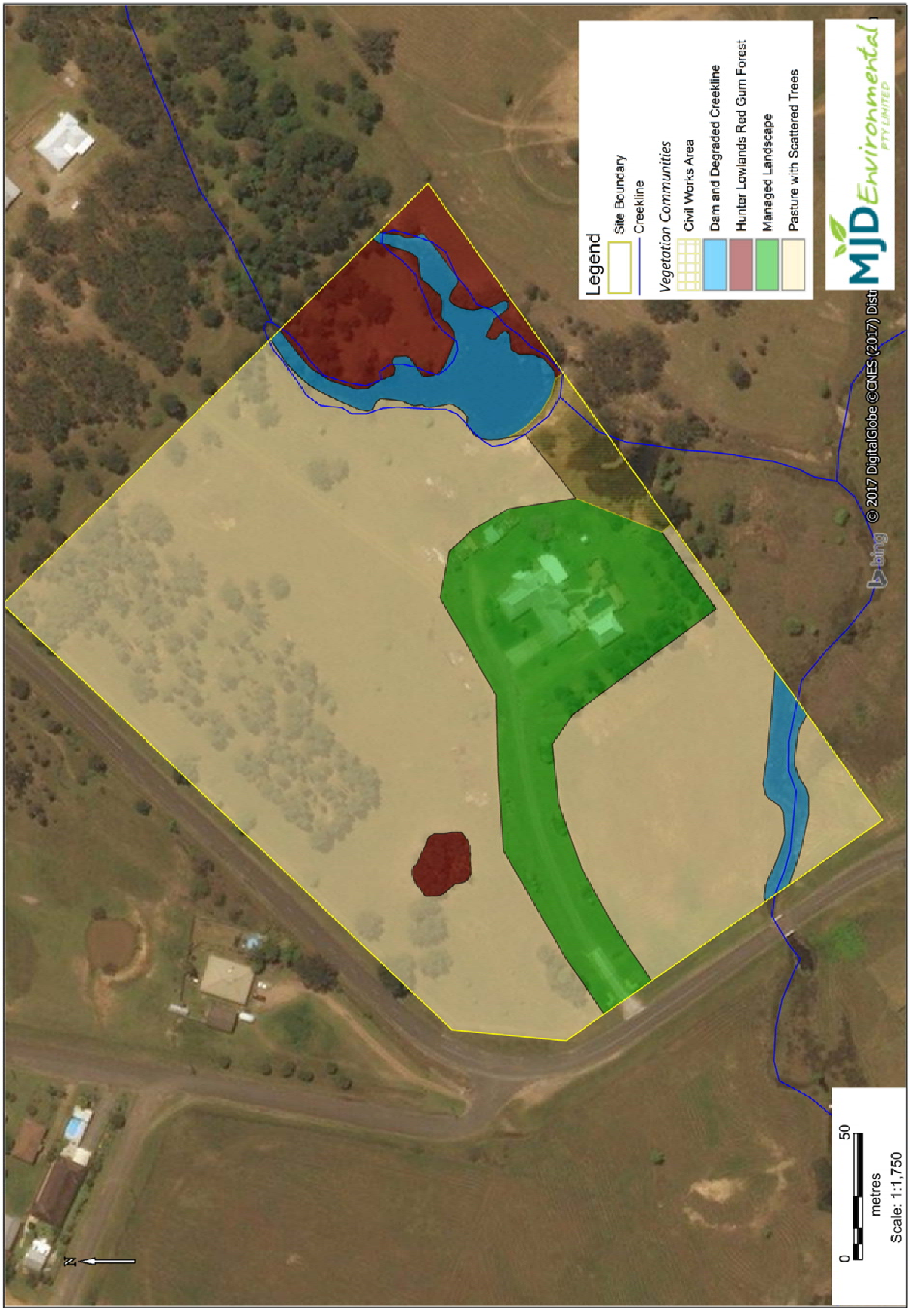


Figure 5 Threatened Fauna Results

4 Impact Assessment

The following section provides an overview of the potential direct, indirect impacts associated with the proposal. This overview has been used to inform a likelihood of occurrence and potential for impacts to occur to threatened species, populations and ecological communities. In such instances this has determined the need for further assessment of significance (7-part test).

4.1 Potential Impacts

The proposed development may result in the following ecological impacts:

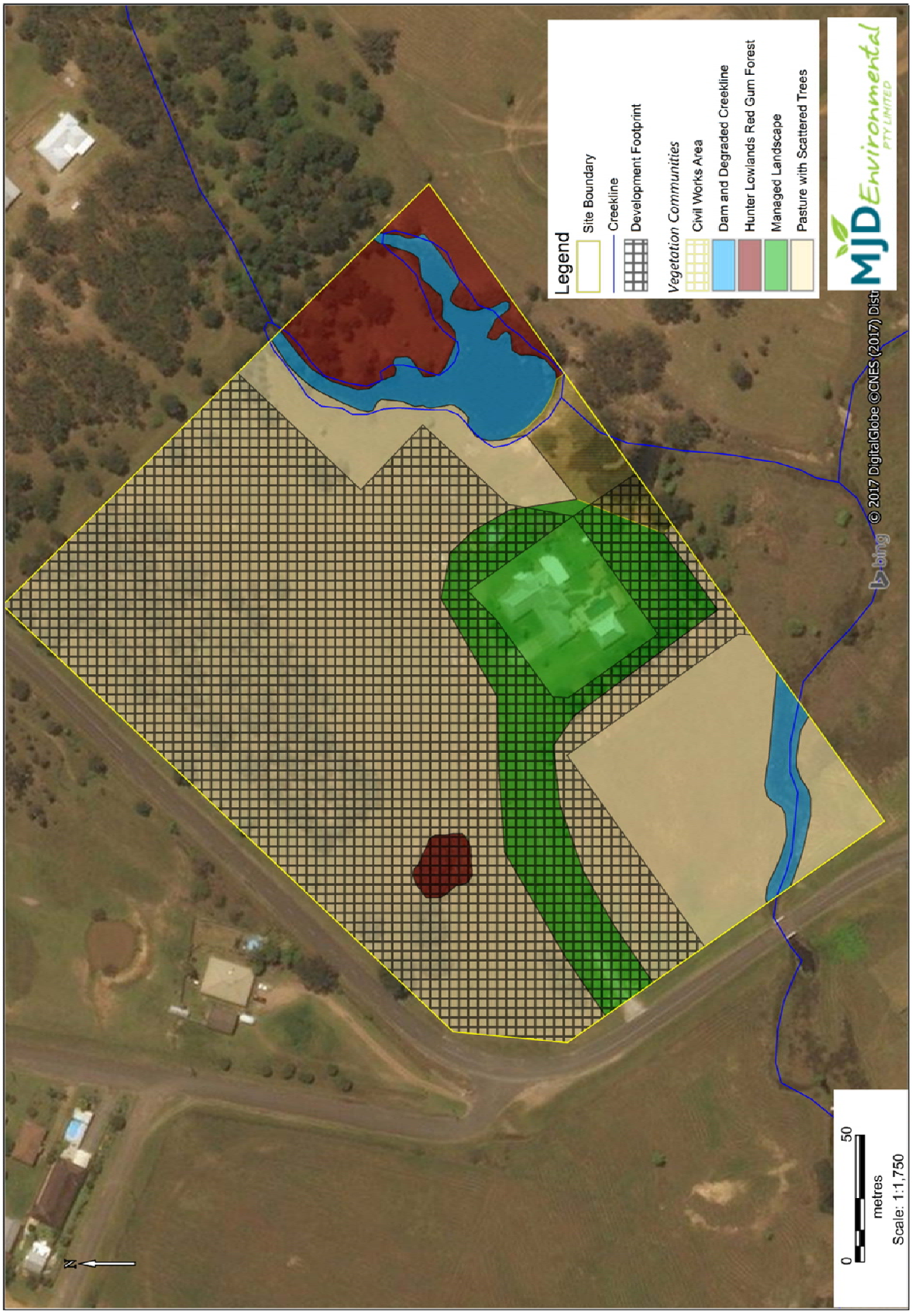
Direct Impacts

- Loss of 430m^2 of low condition Hunter Lowlands Red Gum Forest
- Loss of 3.14ha of disturbed pasture and scattered trees, and
- Loss of 614m^2 of managed landscapes;
- Los of 330m^2 of Degraded creekline that is currently the location of civil works associated road construction in adjacent development
- Removal of *G. robusta,* potential foraging habitat for threatened Grey-headed Flying-fox.

Indirect Impacts

- Potential indirect impacts on adjacent wetland and floodplain vegetation from alterations to water regimes and runoff quality.

Table 4 Development Outcome



4.2 Threatened Species & Communities Likelihood of Occurrence Assessment

Threatened flora and fauna species (listed under the TSC Act and/or EPBC Act) that have been gazetted and recorded within a 10 kilometres radius of the Site have been considered within the assessment contained in **Table 4**. Each species / community is considered for its likelihood to occur on the site and potential for impact arising from the proposal. Where a potential for impact is considered the entity has been nominated for further assessment under an Assessment of Significance (AoS) in **Appendix 3**.

'**Species / Community**' – Lists each threatened species / EEC known from the locality (10 km radius). The status and number of records along with source and notes for each threatened entity under the TSC Act and the EPBC Act are also provided.

'**Habitat / Species Descriptions**' – for up to date threatened species profiles including habitat descriptions and other key ecological information reference is made to the following online resources:

- NSW OEH Threatened Species Profile Search - http://www.environment.nsw.gov.au/threatenedSpeciesApp/
- Commonwealth Biodiversity: Species Profile and Threats Database (SPRAT) - http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

'**Likelihood of Occurrence on Site**' – Assesses the likelihood of each locally recorded species and EEC to occur within the Site, using knowledge of each species' habitat and lifecycle requirements and with regard the habitat types present within the Site, results of the literature review and database searches and field investigations. The location and number of records of the species (OEH Atlas of NSW Wildlife) were also considered in determining probability of occurrence.

'**Potential for Impact**' – Assesses the likelihood of impacts to each species / community that would result from the proposed development, taking into account direct and indirect short and long-term impacts.

Database searches were conducted of the NSW Wildlife Atlas (18-10-2017) and Commonwealth Protected Matters Tool (18-10-2017).

Note: marine species (bird, reptile, fish, mammal) recorded on the Protected Matters have not been listed or assessed herewith.

Table 5 Likelihood of Occurrence and Impact Assessment

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
Flora					
Heath Wrinklewort	*Rutidosis heterogama*	V	V	1	No targeted threatened species surveys where undertaken due to the extensive managed (grazed/ mowed) pastures present within the study area. Pastures on site are primarily dominated by exotic species. Past and current land uses, particularly grazing, have diminished the quality of any remaining habitat and reduced the likelihood that this species would persists on site. On this basis, coupled with the single recorded within a 10km search of the locality, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Bynoe's Wattle	*Acacia bynoeana*	E	V	6	No targeted threatened species surveys where undertaken due to the highly disturbed nature of the study area. Pastures and low quality remnants groundcover layers found on site are primarily dominated by exotic species. Past and current land uses, particularly grazing, have diminished the quality of any remaining habitat and reduced the likelihood that this species would persists on site. On this basis, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
	Asterolasia elegans	E	E	-	No targeted threatened species surveys where undertaken due to the highly disturbed nature of the study area. and the lack of records within a 10km search of the locality. No sandstone habitats which could support this species occur on site, and the site is well outside its known range. On this basis, it is very **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Netted Bottle Brush	*Callistemon linearifolius*	V		1	No targeted threatened species surveys where undertaken due to the highly disturbed nature of the study area. and the low number of records within a 10km search of the locality. The past and present land management practices have resulted in low quality remnant vegetation remaining on site and any habitat suitable being altered or completely removed. On this basis it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
bluegrass	*Dichanthium setosum*	V	V	-	This species has not been recorded within 10km of the site, and the site is outside its known range. Heavy basaltic black soils and red-brown loams with clay subsoil preferred by this species do not occur on site, and species commonly found in association with bluegrass were not recorded on site. On this basis, this species is unlikely to occur on site and **unlikely** to be impacted by the proposal. An AoS is not required for this species.
Eucalyptus camaldulensis population in the Hunter Catchment	*Eucalyptus camaldulensis*	E		1	Targeted threatened species surveys did not detect this species on site. The relatively low number of paddock trees particularly Red Gum species on site, provided sufficient opportunity to positively identify that *E. camaldulensis* was not present within the study area. This species prefers wetter, floodplain habitats that are found north and north-east of the study area adjacent to the Hunter River and associated floodplains. As such it is **unlikely** that species will be impacted by the proposal. An AoS is not required for this species.
Slaty Red Gum	*Eucalyptus glaucina*	V	V	58	Targeted threatened species surveys did not detect this species on site. The relatively low number of paddock trees particularly Red Gum species on site, provided sufficient opportunity to positively identify that *E. glaucina* was not present within the study area. As such it is **unlikely** that species will be impacted by the proposal. An AoS is not required for this species.
Earp's Gum	*Eucalyptus parramattensis* subsp. *decadens*	V	V	3	Targeted threatened species surveys did not detect this species on site. The relatively low number of paddock trees particularly Red Gum species on site, provided sufficient opportunity to positively identify that *E. parramattensis* subsp. d*ecadens* was not present within the study area. Sandy soils preferred by this species also do not occur on site. As such it is **unlikely** that species will be impacted by the proposal. An AoS is not required for this species.
Cymbidium canaliculatum population in the Hunter Catchment	*Cymbidium canaliculatum*	E		2	Targeted threatened species surveys did not detect this species on site. The scattered native trees on site are may support this epiphytic species although no individuals where observed. As such it is **unlikely** that species will be impacted by the proposal. An AoS is not required for this species.
Small-flower Grevillea	*Grevillea parviflora* subsp. *parviflora*	V	V	1	No targeted threatened species surveys where undertaken due to the highly disturbed nature of the study area and the low number of records within a 10km search of the locality. Given the disturbance history over the site this species is unlikely to occur. On this basis, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
North Rothbury Persoonia	*Persoonia pauciflora*	E	CE	91	The known distribution of this species is limited to approximately 4.5km^2 in the vicinity of North Rothbury. The site is not within the known range of this species, and the dispersal capability appears to be quite low, with known populations all within 1km of one another. This species was not recorded during targeted threatened species surveys on site. As such it is **unlikely** that species will be impacted by the proposal. An AoS is not required for this species.
Illawarra Greenhood	*Pterostylis gibbosa*	V	E	1	This species has not been recorded on site during the current survey. The site is not one of the five known locations for this species in the Hunter Valley and is outside the species' known range. Due to the long history of mowing and grazing on the site, this species is unlikely to persist on site. On this basis, it's considered unlikely to occur on site and therefore **unlikely** to be impacted by the proposal. An AoS is not required for this species.
	Euphrasia arguta	CE	CE	-	This species has not been recorded on site or within 10km of the site. This annual herb is unlikely to persist in the heavily grazed and mowed habitat on site. As such it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Austral Toadflax	*Thesium australe*	V	V	-	This species has not been recorded on site or within 10km of the site, and past and current practices (particularly mowing and grazing) have diminished the potential for the species to occur. Given a lack of records for the species within the locality and the poor quality of habitat, it is unlikely to occur on site and **unlikely** to be impacted by the proposal. An AoS is not required for this species.
A Leek orchid	*Prasophyllum sp.* Wybong		CE	-	No targeted threatened species surveys where undertaken due to the highly disturbed nature of the study area. and the lack of records within a 10km search of the locality. The sites location is distant from all known populations situated in the Upper Hunter Valley. As such it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Magenta Lilly Pilly	*Syzygium paniculatum*	E	V	1	This species was not recorded on site. No suitable rainforest habitat is present on site. It is highly unlikely to occur and **unlikely** to be impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
Birds					
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	1	This species was not recorded in the study area and there are very few records within a 10km search of the locality. Only a few scattered Red Gums and Rough-bark Apple on site offer any foraging potential for this species, and nesting in the stands non-native trees on site is very unlikely given the limited forage trees in the surrounding area. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Australasian Bittern	*Botaurus poiciloptilus*	E	E	-	This species has not been recorded on site or within 10 km of the site. Marginal foraging habitat for this species occurs on site. The small farm dam which may be modified (though not removed) by the proposal represents only a small change to potential foraging habitat and contains some of the dense *Typha* fringing vegetation this species prefers. Higher quality wetland areas are widespread along the Hunter River and floodplains. On this basis, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Curlew Sandpiper	*Calidris ferruginea*	E	CE	-	Wetland habitats on site represent poor quality potential foraging habitat for this species, and would likely only be used intermittently by individuals migrating through the area. The modification of habitat around the dams on site represents only a small loss of low quality foraging habitat of a kind which is abundant in the surrounding floodplains of the Hunter River. On this basis, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Glossy Black-Cockatoo	*Calyptorhynchus lathami*	V		3	This species was not detected during the field survey period. Foraging habitat (*Casuarina* and *Allocasuarina* tree species) is present along the margins of the small farm dam on site. The potential forage trees are outside areas of impact and the mostly non-native trees to be cleared on site are unlikely to be visited by individuals foraging in the region. On this basis, it is **unlikely** this species will be impacted by the proposal. An AoS is not required for this species.
Speckled Warbler	*Chthonicola sagittata*	V		11	This species was not recorded during surveys. The site is almost entirely lacking shrubs, dense tall grasses, or any complex vegetation structure in which this species could nest or forage. Due to the lack of habitat and long history of disturbance, this species is unlikely to occur on site, and therefore **unlikely** to be impacted by the proposal. An AoS is not required for this species.
Spotted Harrier	*Circus assimilis*	V		1	This species was not detected within the study area. The wetland areas bordering the study area to the southwest may offer limited foraging potential for this species, however

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
					these dams are not contiguous with any larger wetland complexes, and therefore represent fragmented, marginal foraging. These wetlands will be retained by the proposal, and as such the disturbance to any individuals foraging in the area is expected to be quite low. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*	V		2	This species was not recorded during survey, although there are a few records within 10km and some marginal foraging habitat. Brown Treecreepers typically forage in eucalypt woodlands dominated by stringybarks and rough barked species, often with abundant wood litter and stags. While suitable eucalypt woodland borders the site to the north, the stand of non-native trees within the study area offer only limited foraging potential. Exotic pines are unlikely to support large numbers of arthropods on which this species feeds, and hollows suitable for nesting do not occur within the site. Therefore, while this species may occur on site while moving through the landscape from suitable habitat adjacent to the study area, it is unlikely to utilize the study area for any part of its life cycle and therefore **unlikely** to be impacted by the proposal. An AoS is not required for this species.
Varied Sittella	*Daphoenositta chrysoptera*	V		8	This species has been recorded within 10km of the study area and very limited suitable foraging habitat exists on site. While individuals traversing the site while moving through the wider region have potential to visit and forage in the patch of mostly non-native trees on site, these exotic trees are unlikely to support a significant number of small insects on which this species feeds, and unlikely to be important to the long-term survival of the species in the locality. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Eastern Bristlebird	*Dasyornis brachypterus*	E	E	-	This species has not been recorded on site or within 10km of the site. Suitable habitat for this species is not found on site, as the study area lacks woodlands with the dense understorey that this species requires. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Black-necked Stork	*Ephippiorhynchus asiaticus*	E		1	This species has potential to intermittently forage in wetlands in the study area. The dam and associated wetlands in the study area likely support fish and frogs on which this species could forage. These wetlands are currently in a disturbed state as a result of residential and pastoral activity. The proposal is not likely to modify this habitat such the

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
					local population of this species will be affected. It is **unlikely** that the proposal will impact this species. An AoS is not required for this species.
Red Goshawk	*Erythrotriorchis radiatus*	CE	V	-	Riparian habitats preferred by this species do not occur on site and there are no records within 10km. This species is unlikely to utilize the site for foraging or nesting. As such, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
White-fronted Chat	*Epthianura albifrons*	V		1	This species was not recorded during the current survey and there are few local records. The wetlands on site do not represent suitable habitat for this species, as they lack the low open fringing wetland vegetation that this species prefers for foraging. Therefore, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Black Falcon	*Falco subniger*	V		1	This species has potential to traverse the site intermittently while foraging in the wider region, however the open, managed grassland with stands of non-native trees on site offers very limited foraging potential. The widespread distribution and wide variety of habitats within which this species occurs diminishes the importance of the disturbed habitat that occurs on site. As such, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Little Lorikeet	*Glossopsitta pusilla*	V		4	This species was not detected during the field survey period. The exotic stand of trees on site are unlikely to be visited by individuals foraging in the region. While this species may visit the study area, the scattered native trees within the site are unlikely to be important for individuals foraging in the region. On this basis, it is **unlikely** this species will be impacted by the proposal. An AoS is not required for this species.
Painted Honeyeater	*Grantiella picta*	V	V	1	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the scattered native trees to be cleared by the proposal. Mistletoe species on which this species may feed were not observed on site. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
White-bellied Sea-Eagle	*Haliaeetus leucogaster*	V	M	1	Suitable habitat for this species is not present on site. The aquatic habitats within the study area do not represent foraging habitat for this species, as large fish are highly

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					unlikely to persist in the small, turbid farm dams and shallow swamps. Large, robust trees suitable for nesting are not present on site. As such, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Little Eagle	*Hieraaetus morphnoides*	V		1	This species has potential to traverse the site intermittently while foraging in the wider region, however the open, managed grassland with stands of non-native trees on site offers very limited foraging potential. The widespread distribution and wide variety of habitats within which this species occurs diminishes the importance of the disturbed pasture habitat that occurs on site. As such, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Swift Parrot	*Lathamus discolor*	E	CE	50	This species was not detected during the field survey period. The stand of non-native trees on site are unlikely to be visited by individuals foraging in the region. While this species may visit woodlands adjacent to the study area to the northeast, the scattered native trees within the site are unlikely to be important for individuals foraging in the region. On this basis, it is **unlikely** this species will be impacted by the proposal. An AoS is not required for this species.
Square-tailed Kite	*Lophoictinia isura*	V		1	This species has potential to traverse the site intermittently while foraging in the wider region, however the stand of non-native trees and managed exotic grasslands on site offer very limited foraging potential. The widespread distribution and wide variety of habitats within which this species occurs diminishes the importance of the disturbed pasture habitat that occurs on site. As such, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Turquoise Parrot	*Neophema pulchella*	V		1	This species was not detected during the field survey period. The exotic stand of trees on site are unlikely to be visited by individuals foraging in the region. While this species may visit the study area, the managed grasslands within the site are unlikely to be important for individuals foraging in the region. On this basis, it is **unlikely** this species will be impacted by the proposal. An AoS is not required for this species.

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Barking Owl	*Ninox connivens*	V		1	This species was not detected during the field survey period and potential habitat is limited. However, due to the wide distribution of this species and the availability of marginal foraging habitat on site, this species has potential to occur. The proposal will clear stands of non-native trees with no hollows suitable for nesting, as well as a small area of poor quality foraging habitat in the cleared/managed grassland. However, extensive foraging habitat similar to the grasslands found on site exists in the surrounding area, and higher quality habitat remains in the broader region. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Powerful Owl	*Ninox strenua*	V		1	This species was not detected during the field survey period and potential habitat is limited. Native woodlands where this species would forage for small mammals do not occur on site. The stand of non-native trees is unlikely to support prey species and therefore unlikely to represent foraging habitat. The proposal will clear stands of non-native trees with no hollows suitable for nesting, as well as a small area of poor quality foraging habitat in the cleared/managed grassland. However, extensive foraging habitat similar to the grasslands found on site exists in the surrounding area, and higher quality habitat remains in the broader region. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Far Eastern Curlew	*Numenius madagascariensis*		CE, M	-	Wetlands on site do not constitute suitable habitat for this species and there are no records within 10km of the study area. This coastal species forages in intertidal zones, coastal lagoons, and bays which do not occur on or near the site. It is very unlikely to occur on site and as such **unlikely** to be impacted by the proposal. An AoS is not required for this species.
Scarlet Robin	*Petroica boodang*	V		2	This species was not detected during the field survey and there are few records within 10km of the study area. The site offers only very limited habitat to this woodland species and the non-native stand of trees is unlikely to be utilised. As such, it is highly unlikely to occur. The proposal is **unlikely** to impact this species. An AoS is not required for this species.
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*	V		62	This species was not recorded during field surveys and suitable habitat does not occur. The site lacks woodlands or native regrowth vegetation, and the few managed shrubs and low trees forming part of rural landscaping are not likely to be significant to local individuals. This species prefers to forage in open country with a mosaic of woodland, shrubs, and regrowth, and with some complexity of groundcover such as woody debris

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
					and litter in which to forage. Such habitat features do not occur on site, and therefore this species is unlikely to occur. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Australian Painted Snipe	*Rostratula australis*	E	E	-	This species has not been recorded on site and there are no local records. The small dams and disturbed grasslands that may be impacted by the proposal lack the vegetation cover that this secretive species prefers and as such represent only very poor quality potential foraging habitat. On this basis it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Masked Owl	*Tyto novaehollandiae*	V		1	This species was not detected within the study area and there are few local records. While this species is known to forage in open country, the site is lacking in native vegetation likely to support prey species for the Masked Owl and as such is unlikely to be visited by individuals foraging in the locality. The small stand of non-native trees is too small to support a local population of this species. Therefore, this species is unlikely to occur on site and **unlikely** to be impacted by the proposal.
Mammals					
Spotted-tailed Quoll (SE mainland population)	*Dasyurus maculatus maculatus* (southeastern mainland population)	V	E	7	This species was not opportunistically detected during the field survey period. The highly disturbed nature of the study area, lack of cover, lack of proximate woodland, and proximity to urban areas greatly diminishes the potential for this species to occur. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Koala	*Phascolarctos cinereus*	V	V	3	This species was not detected during the field survey period and no recent records exist for the species in the surrounding region. No preferred feed tree species occur on site. Given the disturbed nature of the study area and the absence of the species from the region in the past decade, it is considered unlikely to occur. On this basis, it is **unlikely** the species will be impacted by the proposal. Additionally, an assessment under SEPP 44 (**Section 4.3.2**) determined the site does not constitute Koala habitat. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
Eastern Pygmy-possum	*Cercartetus nanus*	V		1	This species has not been recorded on site and there are few records within 10km of the site. This species was not opportunistically detected during the field survey period. The site does not contain preferred habitat for this species. The sites isolation from proximate and interconnecting vegetation coupled with the small size of adjacent areas of suitable vegetation in the vicinity of existing residential blocks further reduces the likelihood of this species occurring on site. Therefore, this species is **unlikely** to be impacted by the proposal.
Squirrel Glider	*Petaurus norfolcensis*	V		16	This species was not recorded in the study area during surveys, however there are records within 10km of the study area. Despite the presence scattered remnant native trees and a stand of exotic pines, the isolation of the study area to proximate native canopy vegetation severely limits the potential for this species to utilize habitat on site. The tree plantings and remnant vegetation surrounding residential blocks within the site are unlikely to support a population of Squirrel Gliders due to their small size, disturbance, and isolation. On this basis, it is highly unlikely that this species occurs on site and **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Greater Glider	*Petauroides volans*		V	-	This species has not been recorded on site or within 10km of the site. This species was not opportunistically detected during the field survey period. The site does not contain preferred habitat for this species. The sites isolation from proximate and interconnecting vegetation coupled with the small size by way of comparison to the species requirements is likely to prohibit site occupation. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Brush-tailed Rock-wallaby	*Petrogale penicillata*	E	V	-	This species was not opportunistically detected during the field survey period and there are no records within 10 km. The site does not contain suitable rocky habitat for this species. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	V	V	-	This species has not been recorded on site or within 10km of the site. The site does not contain dense understorey vegetation or heaths preferred by this species. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
New Holland Mouse	*Pseudomoys novaehollandiae*		V	-	This species has not been recorded on site or within 10km of the site. This species was not opportunistically detected during the field survey period. The site does not contain the

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
					sandy heathland habitat preferred by this species and there is very little native groundcover vegetation. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Grey-headed Flying-fox	*Pteropus poliocephalus*	V	V	11	This species was detected foraging on site during the field survey. The site does not contain a permanent or temporary camp for this species. Foraging habitat is present on site in the form of seasonal blossom of scattered remnant native trees, as well as trees used for rural landscaping such as *Grevillea robusta*. While the proposal will remove some potential foraging trees, the species has a widespread distribution and is highly mobile. The few remnant feed trees present on site are not likely to represent important seasonal forage for the local population. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Eastern Freetail-bat	*Mormopterus norfolkensis*	V		14	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. Potential foraging habitat occurs within the study area. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. As a result, it is **unlikely** this species will be significantly impacted by the proposal. An AoS is not required for this species.
Large-eared Pied Bat	*Chalinolobus dwyeri*	V	V	1	This species was not recoded during surveys and there are few records within 10km of the study area. There is no roosting habitat (caves) on site. The site is highly degraded, and isolated from remnant woodlands or areas which may contain roost caves. Therefore, while some limited foraging potential exists, the site is unlikely to represent foraging habitat of any significance to individuals occurring in the locality. On this basis, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V		1	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. Potential foraging habitat occurs within the study area. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. As a result, it is **unlikely** this species will be significantly impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
Little Bentwing-bat	*Miniopterus australis*	V		10	This species was **recorded** during surveys. There is no roosting habitat (caves, tree hollows, or similar man-made structures) on site. The site is highly degraded, and while some limited foraging potential exists, the site is unlikely to represent foraging habitat of any significance to individuals occurring in the locality. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. On this basis, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*	V		26	This species was **recorded** during surveys. There is no roosting habitat (caves) on site. The site is highly degraded, and while some limited foraging potential exists, the site is unlikely to represent foraging habitat of any significance to individuals occurring in the locality. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. On this basis, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Southern Myotis	*Myotis macropus*	V		6	This species has not been recorded within the study area and there are few records within 10km. Potential foraging habitat occurs in the open managed grassland and over the farm dam and freshwater wetland areas. No wetlands will be removed by the proposal, and the development of cleared/disturbed pasture into residential blocks is not likely to significantly diminish the foraging potential of what is currently poor quality foraging habitat. As such it is **unlikely** this species will be impacted by the proposal. An AoS is not required for this species.
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V		3	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. Potential foraging habitat occurs within the study area. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish the likelihood that this species will continue to forage on site. As a result, it is **unlikely** this species will be significantly impacted by the proposal. An AoS is not required for this species.
Eastern Cave Bat	*Vespadelus troughtoni*	V		1	This species may have been recorded on site during the current surveys, however the call recordings could only be identified to a species complex level. The site does not contain roosting habitat for this species. The modification of the foraging area from cleared/disturbed pasture to residential development is unlikely to significantly diminish

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
					the likelihood that this species will continue to forage on site. As a result, it is **unlikely** this species will be significantly impacted by the proposal. An AoS is not required for this species.
Herpetofauna					
Giant Burrowing Frog	*Heleioporus australiacus*	V	V	1	This species has not been recorded on site or within 10km of the site. Preferred habitat for this species does not occur on site and as such it is unlikely to occur and **unlikely** to be impacted by the proposal. An AoS is not required for this species.
Green and Golden Bell Frog	*Litoria aurea*	E	V	-	This species has not been recorded on site and there are no records within 10km of the site. While this species is known to occur in highly degraded wetlands similar to the farm dams found on site, targeted surveys failed to identify this species within potential habitat on site. Due to the lack of records during the current survey and the isolation of the site from known populations in the locality, this species is unlikely to occur. Wetlands will not be removed as a result of the proposal, and wetlands in the study area will not be impacted such as to render them uninhabitable to this species. As such this species is **unlikely** to impacted upon by the proposal. An AoS is not required for this species.
Stuttering Frog	*Mixophyes balbus*	E	V	-	This species has not been recorded on site or within 10km of the site. Preferred habitat of rainforest and wet sclerophyll forest does not occur on site and as such this species is highly unlikely to occur and **unlikely** to be impacted upon by the proposal. An AoS is not required for this species.
Threatened Ecological Communities					
Hunter Lowland Red Gum Forest in the Sydney Basin Bioregion					Floristic surveys have confirmed this community occurs on site. An AoS has been applied in **Appendix 4**
Central Hunter Valley Eucalypt Forest and Woodland Corresponds to Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregion (MU 18 – LHCCREMS)		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.
Hunter Valley Weeping Myall (*Acacia Pendula*) Woodland		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.

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Lowland Rainforest of Subtropical Australia		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland		E	CE	-	Floristic surveys have confirmed this community does not occur on site. An AoS is not required for this species.
Migratory Species					
Oriental Cuckoo	*Cuculus optatus*		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Spectacled Monarch	*Monarcha trivirgatus*		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Black-faced Monarch	*Monarcha melanopsis*		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Fork-tailed Swift	*Apus pacificus*		M	-	This species has not been recorded on site or within 10km of the site. As this species is believed to be almost entirely aerial in this part of its range, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
White-throated Needletail	*Hirundapus caudacutus*		M	-	This species has not been recorded on site or within 10km of the site. As this species is believed to be almost entirely aerial in this part of its range, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Yellow Wagtail	*Motacilla flava*		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found around the dam and this species is unlikely to forage in the area to be cleared by the proposal. On this basis, it is **unlikely** the species will be impacted by the proposal.

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					An AoS is not required for this species.
Satin Flycatcher	*Myiagra cyanoleuca*		M	-	This species has not been recorded on site or within 10km of the site. Only poor quality foraging habitat is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Rufous Fantail	*Rhipidura rufifrons*		M	-	This species has not been recorded on site or within 10km of the site. No suitable habitat (wet sclerophyll forests) is found on site and this species is unlikely to forage in the stand of non-native trees to be cleared by the proposal. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Common Sandpiper	*Actitis hypoleucos*		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Sharp-tailed Sandpiper	*Calidris acuminate*		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Curlew Sandpiper	*Calidris ferruginea*	E	CE, M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.

Common Name	Scientific Name	TSC Act	EPBC Act	No. of Records	Likelihood of Occurrence / Likely Level of Impact
Pectoral Sandpiper	*Calidris melanotos*		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Latham's Snipe	*Gallinago hardwickii*		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.
Osprey	*Pandion haliaetus*	V	M	-	Suitable habitat for this species is not present on site. The aquatic habitats within the study area do not represent foraging habitat for this species, as large fish are highly unlikely to persist in the small, turbid dam. As such, it is **unlikely** that this species will be impacted by the proposal. An AoS is not required for this species.
Common Greenshank	*Tringa nebularia*		M	-	This species has not been recorded on site. Only poor quality foraging habitat is found around the farm dam in the study area and this species is unlikely to forage in the area to be cleared by the proposal. Provided recommended erosion and runoff controls are in place, the quality of wetland habitats within the study area will not be impacted to a degree that foraging potential for this species is diminished. On this basis, it is **unlikely** the species will be impacted by the proposal. An AoS is not required for this species.

Key:

V = Vulnerable
E = Endangered
M = Migratory
CE = Critically Endangered

The following species are being assessed in **Appendix 4** under the 7 Part Test of Significance (TSC Act) based on the likelihood of occurrence results contained in **Table 4**.

Vegetation community

Hunter Lowland Red Gum Forest in the Sydney Basin Bioregion

Based on the likelihood of occurrence results contained in **Table 4**, there is no requirement to undertake an Assessment of Significant for all other threatened entities under the 7-part test as the proposed rezoning in its current form is unlikely to have a significant impact on threatened species such that a local extinction would occur based on likelihood of occurrence.

4.3 Other Legislative Considerations

4.3.1 Key Threatening Processes

A Key Threatening Process (KTP) is defined in the TSC Act as a process that "threatens, or could threaten, the survival or evolutionary development of species, populations or ecological communities". They are listed under Schedule 3 of the TSC Act and may adversely affect threatened species, populations or ecological communities or could cause species, populations or ecological communities that are not threatened to become threatened.

KTP's that have the potential to operate on site and require consideration under the site proposal have been outlined below.

1. Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (*Manorina melanocephala*)
2. Anthropogenic Climate Change
3. Clearing of native vegetation
4. Competition and grazing by the feral European Rabbit (*Oryctolagus cuniculus*)
5. Invasion, establishment and spread of *Lantana camara* (Lantana)
6. Invasion and establishment of exotic vines and scramblers
7. Invasion of native plant communities by exotic perennial grasses
8. Infection of native plants by *Phytophthora cinnamomi*
9. Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae
10. Invasion of native plant communities by African Olive *Olea europaea* subsp. *cuspidata* (Wall. ex G. Don) Cif.
11. Predation by the European Red Fox *Vulpes vulpes*
12. Removal of dead wood and dead trees

Aggressive exclusion of birds from woodland and forest habitat by abundant Noisy Miners (Manorina melanocephala)

The proposal seeks to remove only scattered trees and the Pine plantation over pasture. The Noisy miner was observed in small numbers within the study area. As such it is considered this KTP currently operates within the site and study area. The proposal will result in the removal of scattered

trees that will not result in increased edge of woodlands or forest where this species is known to inhabit. Therefore, it is unlikely the proposal will to contribute to an increase in abundance and activity of the Noisy Miner.

Anthropogenic Climate Change

Modification of the environment by humans is considered to contribute to Climate Change and as a result has been listed as a Key Threatening Process. Land use change and construction activities which are occurring as a result of the proposal are actions that can contribute to greenhouse gas emissions. This may indirectly impact upon known or potentially occurring threatened species as most species depend on climate for their distribution.

The proposal seeks to remove scattered trees, the pine plantation and pasture vegetation from the site. This is unlikely to make a significant contribution to local climate such that alterations resulting in impacts on locally occurring threatened species, populations or ecological communities would occur.

Competition and grazing by the feral European Rabbit (Oryctolagus cuniculus)

The proposal seeks to remove primarily pasture vegetation from the site. It is acknowledged this KTP is likely to operate on site due to the small fragment patches of vegetation coupled with the expansive pasture areas. Furthermore, given the European Rabbit grazes on a wide range of foliage in the groundcover and herbaceous layer, it is also considered that any alteration to the extent and abundance of native or exotic species assemblage would not lead to an increase in activity or abundance of this species on site. The proposal may result in a reduction in the potential area of occupancy of this species.

Invasion, establishment and spread of Lantana camara (Lantana)

This species was observed on site during field surveys with minor to moderate infestations present within the Red gum forest and Pine plantation in the study area. Higher concentrations were found in association with the creekline and Dam that dissects the northern corner of the study area.

The proposal seeks to remove 2.04ha of pasture and Scattered trees. The proposal may result in an immediate reduction of this species within the study area during vegetation clearing works. Due to the higher occurrence of this species within vegetation proposed to be retained, this may increase the potential for Lantana to continue to colonise retained remnant vegetation. On this basis, it is considered that the proposal may increase the prevalence of this KTP which is currently operating within the study area, whilst reducing its effect within the development site.

The removal of this species is recommended throughout the study area via best practice bush regeneration techniques to further reduce and minimise this KTP operating within the study area.

Invasion and establishment of exotic vines and scramblers

The invasive vine species *Lonicera japonica* (Japanese Honeysuckle) was observed within the Lowlands Red Gum Forest in the northern corner of the study area. The location of this species is within vegetation proposed to be retained as part of the residential subdivision resulting in this KTP continuing to operate on site. Although limited to a small section of the vegetation the aggressive nature of this species will result in further invasion and an increase in this KTP operating on site.

The removal of this species is recommended throughout the study area via best practice bush regeneration techniques to further reduce and minimise this KTP operating within the study area

Invasion of native plant communities by exotic perennial grasses

This KTP is considered to be operating on site based on the presence of exotic and perennial species which dominate much of the groundcover on site. The proposal seeks to remove areas of pasture containing perennial grasses, however it is not anticipated that the proposal will trigger an increase to the KTP beyond its current operation across the study area.

Infection of native plants by Phytophthora cinnamomi

The soil born pathogen *Phytophthora cinnamomi* spreads in plant roots and has been known to infect a number of native plants. There was no evidence observed of *P. cinnamomi* impact on site during the survey period. With due consideration of the recommendation and mitigation measures contained within this report, it is considered unlikely that the proposal will contribute to this KTP.

Introduction and establishment of Exotic Rust Fungi of the order Pucciniales pathogenic on plants of the family Myrtaceae

Plants of the family Myrtaceae were not recorded on site. Exotic Rust Fungi may be introduced into the study area by increased movement of plant, vehicles and workers across the study area. It is recommended that anti-contamination procedures be enacted for personnel and equipment to minimise the chance of infection. These mitigation measures will provide an opportunity to enact an anti-contamination program to ameliorate this KTP.

Invasion of native plant communities by African Olive Olea europaea subsp. cuspidata (Wall. ex G. Don) Cif.

This species was observed on the site, however it is not considered the proposal will increase the prevalence of this species and therefore it is unlikely to contribute significantly to this KTP.

The removal of this species is recommended throughout any retained vegetation on site, via best practice bush regeneration techniques to further reduce and minimise this KTP operating within the study area

Predation by the European Red Fox Vulpes vulpes (Linnaeus, 1758)

The proposal does not seek to remove or modify significant patches of vegetation that would offer key hunting habitat for the fox. One fox was observed during nocturnal surveys in the vicinity of the dam. Foraging habitat is for foxes is likely to be reduced as pasture is replaced by residential development. As such it is considered the while this KTP is likely to operate on site, the proposal is unlikely to contribute to an increase in abundance and activity of the European Red Fox.

Predation by the Feral Cat Felis catus (Linnaeus, 1758)

The proposal is for establishment of a residential subdivision. Notwithstanding the likely background levels of Cat predation in the locality, it is likely that the occupation of the residential subdivision will lead to a contribution to this KTP over time. The extent to which shall have a direct relationship to cat ownership levels and owner stewardship.

Removal of dead wood and dead trees

The proposal will require the removal of only scattered pasture trees and scattered woody debris from fallen tree limbs and old fence posts. As a result, the proposal is likely to make only a minor contribution to this KTP.

Clearing of native vegetation

The KTP final determination lists nine factors that have the potential to impact species distribution or result in extinction. These factors are:

1) destruction of habitat resulting in loss of local populations of individual species;
2) fragmentation;
3) expansion of dryland salinity;
4) riparian zone degradation;
5) increased greenhouse gas emissions;

6) increased habitat for invasive species;
7) loss of leaf litter layer;
8) loss or disruption of ecological function; and
9) changes to soil biota.

The proposal seeks to remove a small patch of low quality regrowth Lowlands Red Gum Forest. This loss of vegetation will represent a small amount of habitat loss for potential threatened species in the area.

A further 3,540m^2 of low quality Hunter Lowlands Red Gum Forest will be retained within the study area at the completion of works, reducing the likelihood of local extinctions on site of threatened entities as a result of the proposal.

The proposal will affect habitat connectivity on a very minor scale within the site, it will not further fragment or isolate areas of habitat in the surrounding region then currently experienced. Loss of connectivity within the site will be limited to the small island of regrowth to be cleared for the residential subdivision.

The proposal will have a minor impact on increasing greenhouse gas emissions and a very minor loss on leaf litter layer due the reduction of vegetation within the site.

The current proposal is to encroach on water front land (as defined under the Water Management Act) and current design will result in minor encroachment of riparian vegetation zones, therefore will have a minor impact on riparian areas. The proposal will not be affected by dry land salinity.

The proposal will have a minor impact on ecological function and soil biota. The sites ecological function and soil biota has been impacted prior to the proposal due to the previous land uses in the area, and this can be seen throughout the site with obvious soil disturbance areas such as roads, soil compaction and general landscape modification.

The proposed retained vegetation currently has moderate to high density cover of invasive weed species present, particularly *Pinus radiata* which is codominant in the canopy at some locations and at times creating a monoculture. Lantana, Large Leaf Privet, and Honeysuckle are all present, and have the potential form larger thickets on site.

On this basis, it is considered the KTP will be increased on a small scale in the locality, however it is unlikely that the level of impact will result in a decline and/ or extinction due to reduction in habitat availability from clearing.

4.3.2 SEPP 44 – Koala Habitat Protection

Assessment of potential koala habitat under SEPP 44 requires the following steps be undertaken:

(a) Identification of ‘potential Koala habitat’ within the site area to be impacted; if the total tree cover contains 15% or more of the Koala food tree species listed in Schedule 2 of SEPP 44 then it is deemed to be ‘potential Koala habitat’. Identification of ‘potential Koala habitat requires the determination of the presence of ‘core Koala habitat’;

(b) Identification of ‘core Koala habitat’ within the area to be impacted. ‘Core Koala habitat’ is defined as an area of land with a resident population of Koalas, evidenced by attributes such as breeding females (females with young), recent sightings and historical records of a Koala population;

(c) Identification of ‘core Koala habitat’ will require that a plan of management must accompany the DA application;

(d) If the rezoning of lands, other than to environmental protection, involves potential or core Koala habitat then the Director of planning may require a local environmental study be carried out.

One species of tree listed in Schedule 2 of the SEPP as a 'Koala Feed Tree Species' occurs on the Study Area, being *Eucalyptus tereticornis* (Forest Red Gum). Only a small number of individuals of this species were found widely scattered over pasture, and nowhere on site does it persist in densities of >15% of a woodland and as such would not constitute 'Potential Koala Habitat' as defined under the SEPP.

At no point were Koala feed trees observed on Site at >15% or more of the total tree cover. Additionally, investigations did not detect Koalas or signs of Koalas within the Site. Therefore, the vegetation on the Site does not constitute Potential or Core Koala Habitat.

On this basis no further considerations of the SEPP apply.

4.3.3 Commonwealth EPBC Act

An EPBC Act Protected Matters Search (accessed 18-10-2017) was undertaken to generate a list of those Matters of National Environmental Significance (MNES) from within 10 km of the site. An assessment of those MNES relevant to biodiversity has been undertaken in accordance within EPBC Act Policy Statement 1.1 Significant Impact Guidelines Matters of National Environmental Significance (DoE, 2013). The Matters of National Environmental Significance protected under national environment law include:

- Listed threatened species and communities;
- Listed migratory species;
- Ramsar wetlands of international importance;
- Commonwealth marine environment;
- World heritage properties;
- National heritage places;
- The Great Barrier Reef Marine Park;
- Nuclear actions; and
- A water resource, in relation to coal seam gas development and large coal mining development.

Listed Threatened and Communities

A total of 33 threatened species and 4 threatened ecological communities listed under the EPBC Act have been recorded on the protected matters search. A likelihood of occurrence assessment for these MNES has been completed in **Section 4.2**.

This assessment concluded that the proposal is unlikely to impact the listed threatened species.

No Threatened Ecological Communities listed under the EPBC Act have been recorded within the study area or have been identified within any areas that have potential to be affected by indirect impacts.

Listed Migratory Species

The protected matters search nominated 16 migratory species or species habitat may occur with the 10km site buffer search area. The assessment contained in **Section 4.2** concluded that although migratory species may occupy and utilise various habitats throughout the Site and locality as part of their life cycle, no habitat on site is critical to their survival. Therefore, it is unlikely that the proposal over the site will impact migratory species.

Wetlands of International Significance (declared Ramsar wetlands):

The site is not a wetland of international significance or declared Ramsar wetland. The protected matters search nominates the following wetlands of international importance:

- Hunter Estuary Wetlands

The site is identified as occurring approximately 20 - 30km upstream from this wetland. While surface runoff and flow regimes may be altered by residential development over the pastures on site, provided recommended sedimentation and runoff controls are in place, the proposal will not significantly impact downstream Ramsar wetlands.

Commonwealth Marine Areas:

The Site is not part of or within close proximity to any Commonwealth Marine Area.

World Heritage Properties:

The Site is not a World Heritage area, and is not in close proximity to any such area.

National Heritage Places:

The Site is not a National Heritage area, and is not in close proximity to any such area.

Great Barrier Reef Marine Parks:

The Site is not part of or within close proximity to any Great Barrier Reef Marine Park.

Nuclear Actions:

The proposal over the site is not and does not form part of a Nuclear action.

Water Resources in relation to Coal Mining and CSG:

The proposal over the site is related to land development and as such is not or does not for part of a coal mining and/or CSG proposal.

Summary

In summary the proposed action is unlikely to have an impact to MNES and as such Commonwealth referral under the EPBC Act is not required.

5 Recommendations & Mitigation Measures

Recommendations have been provided to mitigate potential impacts on biodiversity values within the Site and broader Study Area with particular focus on any species, population or ecological community listed under the TSC Act and/or EPBC Act.

- Appropriate Water Sensitive Urban Design (WSUD) principles should be implemented for the proposed subdivision to effectively capture and treat stormwater and runoff. Outputs from stormwater treatment infrastructure should be of a comparable quality and quantity to the existing water regime to maintain the health of the creekline within the study area;
- Appropriate measures should be employed to ensure that machinery working within the study areas do not bring materials (soils etc.) onto the site with the potential to infect surrounding vegetation with Exotic Rust Fungi; and
- Erosion and sediment controls will be implemented to prevent run-off or sediment flows from impacting upon downstream habitats during construction and maintained until such time that formal engineering is installed and operational.

6 Conclusion

MJD Environmental has been engaged by Karl Waeger C/O- HDB Town Planning & Design, to prepare an Ecological Assessment to accompany a rezoning application for a residential subdivision at Lot 1 DP873220, 71 Branxton Street, Greta.

NSW Biodiversity Reforms - This assessment has been prepared with due regard to the transitional arrangements set out under the *Biodiversity Conservation (Savings and Transitional) Regulation 2017* (Transitional Regulations). Under Part 7 clause 27 of the Transitional Regulations, the proposal is categorised as a *pending or interim planning application* pursuant to subclause (e) as the development application has been lodged with the consent authority within 3 months of commencement of the NSW Biodiversity Reforms (25th August 2017), being before 25th November 2017. It is on this basis that the assessment aims to examine the likelihood of the proposal having a significant effect on any threatened species, populations or ecological communities listed under the *NSW Threatened Species Conservation Act 1995* (TSC Act). This assessment recognises the relevant requirements of the EP&A Act 1979 (as amended by the *NSW Environmental Planning and Assessment Amendment Act 1997*). Preliminary assessment was also undertaken having regard to those threatened entities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

This report has been prepared with respect to the *Lower Hunter Central Coast Regional Fauna & Flora Survey Guidelines* (LHCCREMS 2002) and the *Threatened Biodiversity Survey and Assessment Guidelines* (DEC 2004). Due to the lack of native vegetation and fauna habitat on site the survey effort undertaken was modified to suit the current site conditions.

Based on a comprehensive desktop review of threatened species databases and vegetation mapping coupled with a field validation survey, the ecological assessment found:

Vegetation Communities have been delineated across the Site as follows:

A total of four vegetation communities have been delineated within the site being:

- MU 19 Hunter Lowlands Redgum Forest (Low condition);
- Pasture with Scattered trees
- Dam and degraded creekline
- Managed landscape

No threatened flora species were detected during field surveys

Two threatened species, specifically the Little Bent-wing Bat (*Miniopterus australis*) and Eastern Bent-winged Bat (*Miniopterus schreibersii oceanensis*) listed as Vulnerable under the TSC Act, were recorded on site during the field validation survey. No additional threatened species were confidently recorded within the study area.

Assessment under SEPP 44 found that no 'Potential Koala Habitat' occurs within the Site and no further assessment under SEPP 44 was required.

The ecological impact assessment considered whether the removal of vegetation and cleared areas on site would constitute a significant impact on known threatened species, populations and ecological communities from the locality such that a local extinction may occur. The assessment concluded that the proposal was unlikely to have an impact on the threatened entities assessed and therefore, from an ecological perspective, there would be no impediment to development consent being granted for subdivision of this land.

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Appendix 1 Plan of Proposal

Scale - 1:1500 @ A3
Date - 24/07/2017
Revision - A
Drawn - AOB

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Appendix 2 Flora and Fauna Species List

Fauna	
Mammals	
Macropus giganteus	Eastern Grey Kangaroo
Vulpes vulpes	Europearn Red Fox
Pteropus poliocephalus	Grey-headed Flying Fox
Austronomus australis	White-striped Free-tailed Bat
Chalinolobus gouldii	Gould's Wattled Bat
Miniopterus australis	**Little Bent-winged Bat (V)**
Miniopterus schreibersii oceanensis	**Eastern Bent-winged Bat (V)**
Mormopterus planiceps	Southern Free-tailed Bat
Scotorepens balstoni	Inland Broad-nosed Bat
Birds	
Gymnorhina tibice	Australian Magpie
Corvus coronoides	Australian Raven
Chenonetta jubata	Australian Wood Duck
Acridotheres tristis	Indian Myna
Coracina novaehollandiae	Black-faced Cuckoo-shrike
Entomyzon cyanotis	Blue-faced Honeyeater
Acanthiza pusilla	Brown Thornbill
Scythrops novaehollandiae	Channel-billed Cuckoo
Ocyphaps lophotes	Crested Pigeon
Gallinula tenebrosa	Dusky Moorhen
Platycerus eximius	Eastern Rosella
Eopsaltria australis	Eastern Yellow Robin
Cacatua roseicapilla	Galah
Cracticus torquatus	Grey Butcherbird
Rhipidura fuliginosa	Grey Fantail
Ocyphaps lophotes	Crested Pigeon
Dacelo novaeguineae	Laughing Kookaburra
Grallina cyanoleuca	Magpie-lark
Vanellus miles	Masked Lapwing
Sturnus vulgaris	Common Starling
Manorina melanocephala	Noisy Miner
Porphyrio porphyrio	Purple Swamphen
Merops ornatus	Rainbow Bee-eater (M)
Trichoglossus haematodus	Rainbow Lorikeet
Acrocephalus australis	Australian Reed-warbler
Platalea regia	Royal Spoonbill
Cacatua galerita	Sulphur-crested Cockatoo
Malurus cyaneus	Superb Fairy-wren
Anthochaera carunculata	Wattlebird
Hirundo neoxena	Welcome Swallow
Sericornis frontalis	White-browed Scrubwren
Rhipidura leucophrys	Willie Wagtail
Lichenostomus chrysops	Yellow-faced Honeyeater

Fauna	
Herpetofauna	
Chelodina longicollis	Long-necked Turtle
Pseudechis porphyriacus	Red-bellied Black Snake
Crinia signifera	Common Eastern Froglet
Litoria fallax	Eastern Dwarf Tree Frog
Litoria latopalmata	Broad-palmed Frog
Litoria peronii	Peron's Tree Frog
Limnodynastes peronii	Striped Marsh Frog

Flora List

Scientific Name	Common Name
Liquidamber sp.	Liquid amber
Tricoryne elatior	Yellow Autumn Lilly
Conyza sp*	Fleabane
*Cirsium vulgare**	Thistle
*Hypochaeris radicata**	Cats Ears
Ozothamnus diosmifolius	Dogwood
Pseudognaphalium luteo-album.	Cudweed
*Senecio madagascariensis**	Fireweed
*Opuntia stricta**	Prickly Pear
Wahlenbergia gracilis	Bluebells
*Lonicera japonica**	Japanese Honeysuckle
Casuarina glauca	Swamp Oak
Enadia hastata	Saltbush
Carex appressa	
Cypress polystachyos	
Maytenus silvestris	
Breynia oblongifolia	Coffee Bush
Acacia parvipinnula	
Jacksonia scoparia	Dogwood
*Romluea rosea**	Onion grass
*Juncus acutus**	Spiny Rush
Juncus usitatius	
*Cinnamomum camphora**	Camphor Laurel
Tricoryne elatior	
Lomandra confertifolia	
Lomandra filiformis	
Lomandra multiflora	
Parvonia hastata	
*Sida rhombifolia**	
Angophora floribunda	
Eucalyptus tereticornis	Forest Red Gum
*Ligustrum sinense**	Small-Leaf Privet
*Ligustrum lucidium**	Large-leaf Privet

Scientific Name	Common Name
Olea europeae subsp. *cuspidata**	African Olive
Ludwigia peploides	Water Primrose
*Phytolacca octandra**	Ink weed
*Pinus radiata**	Monterey Pine
Pittosporum undulatum	Sweet Pittosporum
*Plantago lanceolata**	Lambs tongue
Agrostis avenacea	Blown Grass
*Andropogon virginicus**	Whiskey Grass
*Axonopus fissifolius**	Carpet grass
Aristida ramosa	Three-awn Spear grass
Briza major	
Cynodon dactylon	Couch grass
Eragrostis brownii	
*Eragrostis curvulea**	African Love Grass
Imperata cylindrica	Bladey Grass
*Paspalum dilatatum**	Dallas Grass
Pennisetum clandestine	Kikuyu
Rytidoperma bipartitum	Wallaby Grass
Themeda triandra	Kangaroo Grass
Persicaria decipiens	Slender Knotweed
*Lysimachia arvensis **	Scarlet Pimpernel
Hakea sericea	Needle Bush
Grevillea robusta	Silky Oak
Persoonia linearis	
Cheilanthes sieberi	Poison Rock Fern
*Salix babylonica**	Willow
*Cestrum parquai**	Green Cestrum
Typha orientalis	Bullrush
*Lantana camara**	Lantana
*Verbena bonariensis**	Purple top
*Verbena rigida**	Creeping Verbena
Viola betonicifolia	Violet

Appendix 3 Assessment of Significance (7-part Test)

Section 5A of the EP&A Act lists seven factors that must be taken into account in the determination of the significance of potential impacts of proposed activities on 'threatened species, populations or ecological communities or their habitats' (threatened biota) listed under the TSC Act. The '7-part test' is used to determine whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitats and thus whether a Species Impact Statement (SIS) is required to be produced.

The significance of the impacts on those threatened species and EECs which have been recorded in the Site or are likely to occur and are likely to utilise habitat to be potentially impacted by the proposal (see **Table 3**) have been assessed. This assessment concluded that all species were unlikely to be impacted by the proposal. As such and for completeness the following broad 7-part test provides coverage for the following entities.

Flora	
Heath Wrinklewort	*Rutidosis heterogama*
Bynoe's Wattle	*Acacia bynoeana*
	Asterolasia elegans
Netted Bottle Brush	*Callistemon linearifolius*
bluegrass	*Dichanthium setosum*
Eucalyptus camaldulensis population in the Hunter Catchment	*Eucalyptus camaldulensis*
Slaty Red Gum	*Eucalyptus glaucina*
Earp's Gum	*Eucalyptus parramattensis* subsp. *decadens*
Cymbidium canaliculatum population in the Hunter Catchment	*Cymbidium canaliculatum*
Small-flower Grevillea	*Grevillea parviflora* subsp. *parviflora*
North Rothbury Persoonia	*Persoonia pauciflora*
Illawarra Greenhood	*Pterostylis gibbosa*
	Euphrasia arguta
Austral Toadflax	*Thesium australe*
A Leek orchid	*Prasophyllum sp.* Wybong
Magenta Lilly Pilly	*Syzygium paniculatum*
Birds	
Regent Honeyeater	*Anthochaera phrygia*
Australasian Bittern	*Botaurus poiciloptilus*
Curlew Sandpiper	*Calidris ferruginea*
Glossy Black-Cockatoo	*Calyptorhynchus lathami*
Speckled Warbler	*Chthonicola sagittata*
Spotted Harrier	*Circus assimilis*
Brown Treecreeper (eastern subspecies)	*Climacteris picumnus victoriae*
Varied Sittella	*Daphoenositta chrysoptera*
Eastern Bristlebird	*Dasyornis brachypterus*
Black-necked Stork	*Ephippiorhynchus asiaticus*
Red Goshawk	*Erythrotriorchis radiatus*
White-fronted Chat	*Epthianura albifrons*
Black Falcon	*Falco subniger*
Little Lorikeet	*Glossopsitta pusilla*
Painted Honeyeater	*Grantiella picta*
White-bellied Sea-Eagle	*Haliaeetus leucogaster*
Little Eagle	*Hieraaetus morphnoides*
Swift Parrot	*Lathamus discolor*

Square-tailed Kite	*Lophoictinia isura*
Turquoise Parrot	*Neophema pulchella*
Barking Owl	*Ninox connivens*
Powerful Owl	*Ninox strenua*
Far Eastern Curlew	*Numenius madagascariensis*
Scarlet Robin	*Petroica boodang*
Grey-crowned Babbler (eastern subspecies)	*Pomatostomus temporalis temporalis*
Australian Painted Snipe	*Rostratula australis*
Masked Owl	*Tyto novaehollandiae*
Mammals	
Spotted-tailed Quoll (SE mainland population)	*Dasyurus maculatus maculatus* (southeastern mainland population)
Koala	*Phascolarctos cinereus*
Eastern Pygmy-possum	*Cercartetus nanus*
Squirrel Glider	*Petaurus norfolcensis*
Greater Glider	*Petauroides volans*
Brush-tailed Rock-wallaby	*Petrogale penicillata*
Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*
New Holland Mouse	*Pseudomoys novaehollandiae*
Grey-headed Flying-fox	*Pteropus poliocephalus*
Eastern Freetail-bat	*Mormopterus norfolkensis*
Large-eared Pied Bat	*Chalinolobus dwyeri*
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*
Little Bentwing-bat	*Miniopterus australis*
Eastern Bentwing-bat	*Miniopterus schreibersii oceanensis*
Southern Myotis	*Myotis macropus*
Greater Broad-nosed Bat	*Scoteanax rueppellii*
Eastern Cave Bat	*Vespadelus troughtoni*
Herpetofauna	
Giant Burrowing Frog	*Heleioporus australiacus*
Green and Golden Bell Frog	*Litoria aurea*
Stuttering Frog	*Mixophyes balbus*
Threatened Ecological Communities	
Hunter Lowlands Red Gum	
Central Hunter Valley Eucalypt Forest and Woodland Corresponds to Central Hunter Ironbark-Spotted Gum-Grey Box Forest in the NSW North Coast and Sydney Basin Bioregion (MU 18 – LHCCREMS)	
Hunter Valley Weeping Myall (*Acacia Pendula*) Woodland	
Lowland Rainforest of Subtropical Australia	
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

All threatened species have been addressed for likelihood of occurrence and potential for impact in under Table 4 of this report. This assessment concluded that all species were unlikely to occur on the site or the habitat conditions present on the site are of low quality such that the site would not represent core habitat for any species addressed.

On this basis, it is considered unlikely that the proposal will have an adverse effect on the life cycle of the entities such that a viable local population of the species is likely to be placed at risk of extinction.

b) In the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

No endangered populations were considered as having potential to occur on site. Therefore, the action proposed is not likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction.

c) In the case of an endangered ecological community or critically endangered ecological community, whether the action proposed:

i. is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

ii. is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

One Endangered Ecological Communities have been recorded on site being *Hunter Lowlands Red Gum Forest in the Sydney Basin Bioregion*

The proposal will remove approximately:

- 430m^2 of low condition regrowth Hunter Lowlands Red Gum Forest

In addition, the proposal intends to retain:

- 3,540m^2 low condition Hunter Lowlands Red Gum Forest);

The removal of 430m^2 of low condition regrowth Hunter Lowland Red Gum Forest is unlikely to have an adverse effect or adversely modify the extent of either of the Endangered Ecological Communities such that its local occurrence is likely to be placed at risk of extinction.

d) In relation to the habitat of a threatened species, population or ecological community:

i. the extent to which habitat is likely to be removed or modified as a result of the action proposed,

The proposal will remove habitat as follows:

- Loss of 430m2 of low condition Hunter Lowlands Red Gum Forest
- Loss of 3.14ha of disturbed pasture and scattered trees, and
- Loss of 614m2 of managed landscapes;
- Los of 330m2 of Degraded creekline that is currently the location of civil works associated road construction in adjacent development

All vegetation to be removed as part of this proposal is considered to be low condition and has limited suitable habitat for threatened species in the locality.

ii. whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed action, and

The proposal is not considered to increase fragmentation or isolation in the local landscape given the highly disturbed nature of the existing area.

iii. the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality

Generally the habitat has been determined as not being of significance to the viability and long term survival of the threatened entities assessed herewith.

The proposal will remove or modify low quality foraging habitat for hollow-dependent and cave-dwelling microbat species. However, the change in much of this foraging habitat from grazed pasture land to residential development is unlikely to affect the long-term survival of these microbats in the locality.

e) Whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)

No critical habitat for any threatened species or ecological communities occurs on site, therefore the proposal is unlikely to impact upon such habitat.

f) Whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan,

- *Chalinolobus dwyeri* Large-eared Pied Bat

The modification of foraging habitat from cleared pasture with exotic pines to residential development as a result of the proposal is potentially and to a very limited degree inconsistent with objective 2.1 (Protection of known roosts and associated foraging habitats and management of threats) of the national recovery plan for the Large-eared Pied Bat.

Forest Owls

- *Ninox connivens* Barking Owl;
- *Ninox strenua*; and
- *Tyto novaehollandiae* Masked Owl.

The removal of scattered pasture trees as a result of the Project is, to a very limited degree, inconsistent with objective 5 (minimise loss and fragmentation of owl habitat areas) of the Large Forest Owl Recovery Plan (DEC 2006) as the proposal will remove areas that could represent low quality foraging habitat on as part of a wider home range.

- *Pteropus poliocephalus* Grey-headed Flying-fox

The removal of habitat as a result of the Proposal is inconsistent with objective 3.3.1 Habitat loss, in particular the loss of the single isolated *Ficus macrophylla* (Moreton Bay Fig) on site, of the Draft Recovery Plan for the Grey-headed Flying-fox *Pteropus poliocephalus* (DoE 2017). The loss of this single tree, occurring within a large expanse of cleared pasture, constitutes a very limited contravention of this recover plan.

More broadly the NSW OEH are in the early phases of implementing the 'Saving our Species' program, that aims to secure species in their natural settings for the next 100 years. The intent is to manage threatened species one of six streams being:

1) Site managed species
2) Iconic species
3) Data-deficient species
4) Landscape-managed species
5) Partnership species
6) Keep watch species

Based on management allocation, each species will be prioritised by OEH. At the time of reporting, most fauna species assessed were nominated as 'Landscape-managed Species'.

With regard to the six management streams of the 'Saving our Species' program, the proposal does not constitute a significant contravention of objectives or actions outlined within these management streams:

7) Site managed species – the study area neither contains nor is adjacent to conservation management sites currently identified for threatened species assessed herewith, and does not interfere either directly or indirectly with conservation projects underway at these sites.
8) Iconic species – the study area does not currently support any iconic species and does not contain any suitable habitat for these species.
9) Data-deficient species – the proposal does not interfere with any research objectives related to these species.
10) Landscape-managed species – the proposal will occur within previously cleared land, and as such will not contribute to clearing or degradation of native vegetation such that these species could be affected by loss of habitat.
11) Partnership species – the study area does not contain key populations, breeding sites, or declining populations of these species.
12) Keep watch species – the proposal does not significantly contribute to any developing threats to these species.

The removal of habitat as a result of the Proposal is inconsistent at a minor level with the critical action associated with this management action:

- The key threats to the viability of landscape-managed species are loss, fragmentation and degradation of habitat, and widespread pervasive factors such as impacts of climate change and disease.

The status of known management actions for flora and fauna species is discussed below:

- Anthochaera phrygia Regent Honeyeater "Site Managed Species"

A strategy for the management of Regent Honeyeaters has been developed under the NSW Save Our Species program. Under the program the species has been assigned to the Site-managed species stream. In order to facilitate long term conservation of this species, five conservation management sites have been set up in NSW as follows:

- Bundarra – Gunnedah, Gwydir, Tamworth, Uralla LGA's
- Lower Hunter Valley – Cessnock, Singleton LGA
- Capertree Valley – Lithgow, Mid-Western Region
- Taronga Zoo
- Mudgee/Wollar

The site is not located in or adjacent to any of the above mentioned conservation management sites.

- *Eucalyptus glaucina* "Site Managed Species"

Saving Our Species program. Under the program the species has been assigned to the Site-managed species stream. In order to facilitate long term conservation of this species, two conservation management sites have been proposed in NSW as follows:

- Breamar Richmond Valley LGA; and
- Minimbah Singleton and Cessnock LGA.

The site is not located in or adjacent to either of the dedicated conservation management sites.

- Hunter Lowlands Red Gum Forest "Species Action Statement"

A strategy for the management of Hunter Lowlands Red Gum Forest is currently being developed under the NSW Save Our Species program. A set of broad interim management actions have been prepared for ecological communities.

Given the proposal will impact 430m^2 of low condition habitat associated with this community, it is unlikely to contravene any interim objectives.

g) Whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process.

Key Threatening Processes (KTPs) are listed under Schedule 3 of the TSC Act 1995. KTPs considered relevant to the proposal is described in **Section 4.3.1**. This assessment concluded that the proposal was unlikely to trigger KTPs currently not operating on site and/or not significantly contribute to or increase the activity of a KTP operating on the site.

Appendix 4 Anabat Report