LODGE
ENVIRONMENTAL

Date: 12 May 2023
Project Code: LE1500

ECOLOGICAL CONSTRAINTS & OPPORTUNITIES

297 and 365
MARSHALL MOUNT ROAD
MARSHALL MOUNT

PREPARED FOR
MAKER ENGINEERING

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Project Name:

297 and 365 Marshall Mount Road, Marshall Mount- **Ecological Constraints & Opportunities**

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Prepared by:	
Emma McIntyre *Principal Planner* Emma Cooper *Junior Restoration Ecologist*	Lodge Environmental Pty Ltd ABN 85 631 988 148 Scientific Licence SL102041 Animal Research Authority – Flora and Fauna Survey Mobile: 0423 296 045 Email: info@lodgeenviro.com.au
Reviewed by:	
Jack Talbert *Accredited Biodiversity Assessor BAAS18140*	

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1.0 INTRODUCTION

Lodge Environmental Pty Ltd were commissioned by Tim Howe of Maker Engineering to prepare this Ecological Constraints and Opportunities Assessment (ECO) in anticipation of a subdivision at 297 and 365 Marshall Mount Road, Marshall Mount NSW, 2530. Both lots are herein referred to as the ***Study Area***.

The ***Subject Site*** for the ECO is land in the Study Area that is currently zoned C4 Environmental Living under the Wollongong Local Environmental Plan 2009 and is subject to a Minimum Lot Size of 4,999m^2. By contrast, the existing R2 Low Density Residential land to the west is subject to a Minimum Lot Size of 449m^2.

This report has been prepared to accompany a Planning Proposal and associated Neighbourhood Plan for the land holding which will deliver a broader range of housing which is site responsive and responds to servicing capabilities.

Generally, the Planning Proposal seeks to adopt an implied lot size of 1,000m^2 (mapped as 999m^2) over the western portion of the land, and retain the current 4,999m^2 minimum lot size over the eastern portion of the land. This will deliver a transition in the lot size and housing arrangements.

The Neighbourhood Plan will address more detailed design outcomes as prescribed under the Wollongong DCP consistent with the lot sizes under the Planning Proposal.

A Flora and Fauna Assessment was prepared by Lodge Environmental in 2021 for the Study Area, although access restrictions prevented any field validation within 297 Marshall Mount Road. For the ECO, a desktop study was conducted to review the current legislative context, existing literature and databases for known ecological constraints and values of the area. Field survey was also undertaken to identify and map ecological constraints and their value.

1.1 SITE DESCRIPTION

The Subject Site address is 297 and 365 Marshall Mount Road, Marshall Mount, 2530 (Lot 5 DP 24143, Lot 8 DP 626078) and is located within the Wollongong City Council (WCC) Local Government Area (LGA), with WCC being the consent authority.

The lots are predominately cleared with stands of native vegetation surrounding the riparian areas. 297 Marshall Mount Road contains an existing dwelling, a large farm dam, several sheds and a sealed driveway. 365 Marshall Mount Road contains an existing dwelling, three farm dams, several sheds and a sealed driveway.

The land within the Subject Site is zoned C4 – Environmental Living. The total area of the Subject Site is 18.60ha.

1.2 OBJECTIVES

The Planning Proposal for the Subject Site will be designed to avoid and minimise impacts to ecological constraints in the first instance. The objective of this ecological constraints assessment is to identify and map areas with high ecological values that should be avoided and conserved.

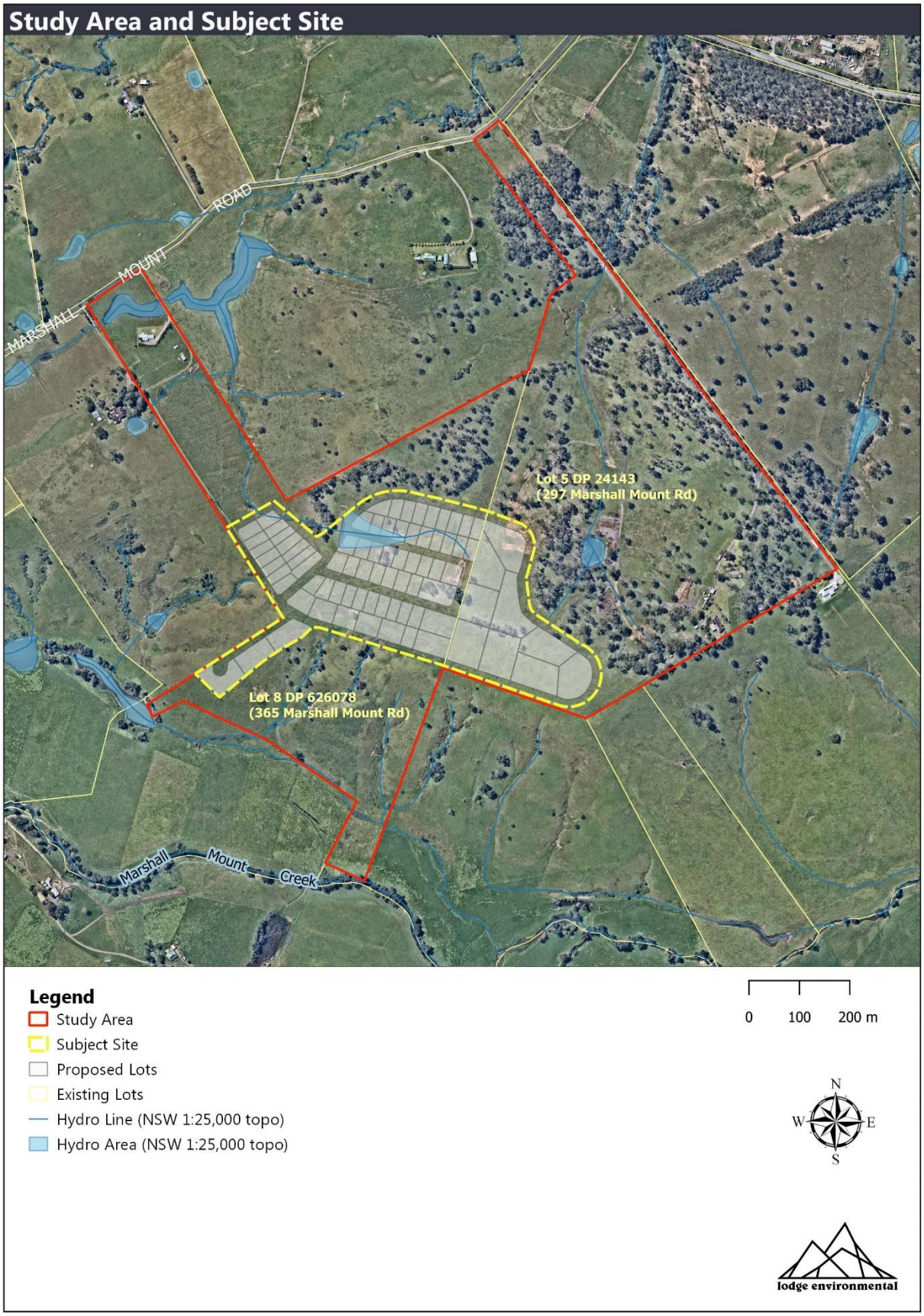


Figure 1: Aerial view of the Study Area and Subject Site

2.0 LEGISLATIVE CONTEXT

Table 1 summarises the legislation and planning policies that have been reviewed in accordance with the objectives of the Ecological Constraints and Opportunities Assessment for the Study Area.

Table 1: Legislative context

	Overview/Relevancy	How it applies
Commonwealth Legislation		
Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Provides a legal framework to protect and manage national and internationally important flora, fauna, ecological communities, and heritage places.	Where applicable, the assessment criteria relevant to this Act must be drawn upon to determine whether there would be a significant impact on any threatened species, populations and communities and hence whether referral to the Federal Environmental Minister is required.
State Legislation		
Biodiversity Conservation Act, 2016 (BC Act)	The primary objective of this act is to ensure the conservation and improvement of biodiversity including ecological communities and threatened species. This act outlines key threatened processes to biodiversity and establishes framework to avoid and minimise harm to both animals and plants	The potential impact of proposed development on any threatened species, populations or communities is assessed through application of an Assessment of Significance (AoS) under Section 7.3 of the BC Act at the development application stage. If the impacts on the area are found to be 'significant', a Biodiversity Development Assessment Report (BDAR) would be required. A BDAR would be deemed necessary if any proposed development were to involve clearance of vegetation mapped on the State Biodiversity Values Map (BVM) or involve native vegetation clearance above the thresholds tables within the BC Act.
Biosecurity Act, 2015	The primary object of this Act is to provide a framework for the prevention, elimination, and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers, or potential carriers.	Under the *Biosecurity Act 2015*, all landowners or land managers have a "General Biosecurity Duty to prevent or minimise the Biosecurity Risk posed or likely to be posed by Priority Weeds". Under this act, Local control authority has a legal obligation to manage the biosecurity risk posed or likely to be posed to human health, the economy, community, and environment by Priority Weeds.
Environmental Planning and Assessment Act, 1979 (EP&A Act)	To protect the environment, including the conservation of threatened and other species of native animals, plants ecological communities and their habitats	The NSW EP&A Act is the principal planning legislation for the state, providing a framework for the overall environmental planning, and development assessment process. Various legislative instruments, such as the BC Act, NSW Water Management Act 2000 (WM Act) and NSW Rural Fires Act 2007 (RF Act) are integrated with the EP&A Act
Rural Fires Act, 1997	Provides the protection of the environment by requiring certain actives to be carried out having regard to the principles of ecological sustainable development	The Planning for Bush Fire Protection (PBP; NSW RFS 2019) document provides a guide for application of bush fire protection measures to be considered for proposed development. Depending on the type of development being proposed, such measures may require the provision of Asset Protection Zones (APZs) which would require clearing of vegetation to reduce bush fire risk.
Water Management Act, 2000	The NSW Natural Resource Access Regulator (NRAR) administers this act and is required to assess activities carried out on waterfront land. Waterfront land includes the bed and bank of any river, lake or estuary and all land within 40	NRAR recommends a Vegetated Riparian Zone (VRZ) is provided adjacent to the channel to provide a protective buffer between catchment land uses and aquatic habitat. The width of the VRZ within waterfront land is measured from the top of the highest bank on both sides of the watercourse, and widths are based on watercourse order as classified under the Strahler

	Overview/Relevancy	How it applies
	meters of the highest bank of the river, lake, or estuary.	Stream Order of watercourses as mapped in NSW Hydro Line Spatial Data.
State Environmental Planning Policies		
State Environmental Planning Policy (Biodiversity and Conservation) 2021	This SEPP relates to biodiversity and conservation matters including vegetation in non-urban areas, koala habitat protection and water catchments.	Wollongong LGA is within the Allowable Clearing Map for Chapter 2 of the SEPP – Vegetation in Non-Rural Areas, and further the Subject Site is zoned C4 Environmental Living, to which Chapter 2 applies. Chapter 2 specifies that *'a person must not clear vegetation in this area without Council's permission'*, and further that *'a person must not clear native vegetation that exceeds the biodiversity offsets scheme threshold without the authority conferred by an approval granted by the Native Vegetation Panel'*.
State Environmental Planning Policy (Resilience and Hazards) 2021	The purpose of this policy is to promote and integrated and coordinated approach to land use planning in the coastal zone in a manner consistent with the objectives of the *Coastal Management Act 2016*, as well as ensuring that any development that is potentially hazardous is assessed appropriately.	A portion of the Study Area (outside of the Subject Site), that occurs adjacent to Marshall Mount Creek is identified as 'proximity area for coastal wetlands'. No development is proposed within this portion of the study area.
Regional Environmental Plans		
Illawarra Shoalhaven Regional Plan 2041	The Illawarra Shoalhaven Regional Plan 2041 (ISRP) aims to protect and enhance the region's assets and plan for a sustainable future. It is a 20-year land use plan prepared in accordance with section 3.3 of the *Environmental Planning and Assessment Act 1979* and applies to the local government areas of Wollongong, Shellharbour, Kiama and Shoalhaven.	The Study Area is within the 'West Lake Illawarra Growth Area' of the ISRP. The Regional Plan supports 'unlocking housing supply' in West Illawarra and Nowra Bomaderry through infrastructure planning and coordination' .
Local Environmental Plan		
Wollongong Local Environmental Plan, 2009	The Wollongong Local Environment Plan 2009 (LEP) is the principal planning instrument for the WCC LGA. The LEP sets out the planning framework and establishes the requirements for the use and development of land in the LGA. The LEP provides broad direction with regard to what types of development are permitted within specific land use zones.	The Subject Site contains land zoned as C4-Environmental Living. The objectives of this zone are to provide for low-impact residential development in areas with special ecological, scientific or aesthetic values, and to ensure that residential development does not have an adverse effect on those values. The proposed residential subdivision is permissible with consent. Portions of the Subject Site are identified as 'Natural resource sensitivity – terrestrial biodiversity' (Clause 7.2) and 'Riparian Land' (clause 7.4). This is discussed further in section 4.4.
Other		
South East Regional Strategic Weed Management Plan 2017-2022	Outlines strategic actions to guide a collaborative weed management and provides guidance for coordinated actions to identify, minimise, respond and manage high risk weeds	Obligation to control, reduce or eliminate certain weeds from the property.

3.0 METHODS

3.1 DATA AND LITERATURE REVIEW

Data records and relevant literature pertaining to the ecological constraints and values of the Study Area and surrounding areas were reviewed. The material reviewed included:

- NSW Bionet Atlas, database search (10km), accessed 3rd April 2023.
- EPBC Act Protected Matters Search Tool search (10km), accessed 3rd April 2023.
- State Biodiversity Values Map, accessed 3rd April 2023.
- State Vegetation Type Map (DPE 2022).
- Relevant legislation and planning policies.
- Previous ecological assessments, including Flora and Fauna Assessment conducted by Lodge Environmental, June 2021.
- Aerial photography (Nearmap).
- Eplan Property Reports.

3.2 FIELD SURVEY

Field survey of 365 Marshall Mount Road was conducted on 14th May 2021 as part of the Flora and Fauna Assessment in 2021. Survey of 297 Marshall Mount Road was undertaken on 4th April 2023 by ecologists Luke Jeffery and Tamika Flanigan, to include the following methods:

- Identification of plant species and vegetation communities present within the Subject Site.
- Search for signs of threatened species, observe and record significant flora and fauna – threatened and migratory species, other incidental fauna observations.
- Observe and record current disturbance and threats (e.g. weeds, trampling, litter).
- Identification of potential habitat for threatened flora and fauna species/populations (e.g. habitat bearing trees (HBTs), creeks, boulders etc) and record with a GPS.
- Recording presence of environmental weeds.
- Taking reference photographs of the entire site.

3.3 SURVEY LIMITATIONS

Both surveys were conducted during Autumn and may be outside of the optimal survey period for some flora and fauna species. It is therefore possible that some species may not have been detected due to their seasonal geographic variation. Cryptic species may not have been obvious. Targeted surveys were not conducted during the site visit. A conservative approach was applied in the assumption of the presence of species that could potentially occur within the Study Area. In this regard, the survey is considered adequate for the purposes of this report.

4.0 DESKTOP REVIEW

4.1 EXISTING VEGETATION MAPPING

A review of the State Vegetation Type Mapping (DPE, 2022), identified the following Plant Community Types within the Study Area (refer **Figure 2**):

- PCT 3056 – Central Eastern Ranges Riparian Dry Rainforest
- PCT 3078- Illawarra Lowland Wet Vine Forest
- PCT 3327- Illawarra Lowland Red Gum Grassy Forest
- PCT 3330- South Coast Lowland Woollybutt Grassy Forest
- PCT 4084- Southern Escarpment River Oak Forest

4.2 BIODIVERSITY VALUES MAP

A review of the state Biodiversity Values Map was conducted on 3rd April 2023.

Riparian vegetation along Marshall Mount Creek is mapped within the Biodiversity Values Map, and a small area occurs within the southern portion of the Study Area (refer **Figure 3**).

Any clearance of mapped vegetation would trigger entrance into the Biodiversity Offset Scheme.

4.3 BUSHFIRE PRONE LAND

As described in section 2, the *Rural Fires Act 1997* provides requirements for development of land that is bushfire prone. The Study Area contains land that has been identified as bushfire prone land Vegetation Category 1 and vegetation buffer (**Figure 4**).

The Subject Site does not contain any land that has been mapped as Bushfire Prone Land. Regardless, any proposed subdivision may need to consider requirements for an Asset Protection Zone (APZ) due to proximity of vegetation. If clearing of any vegetation is required to provide APZs outside the area of the Subject Site, this would require further assessment under the BC Act.

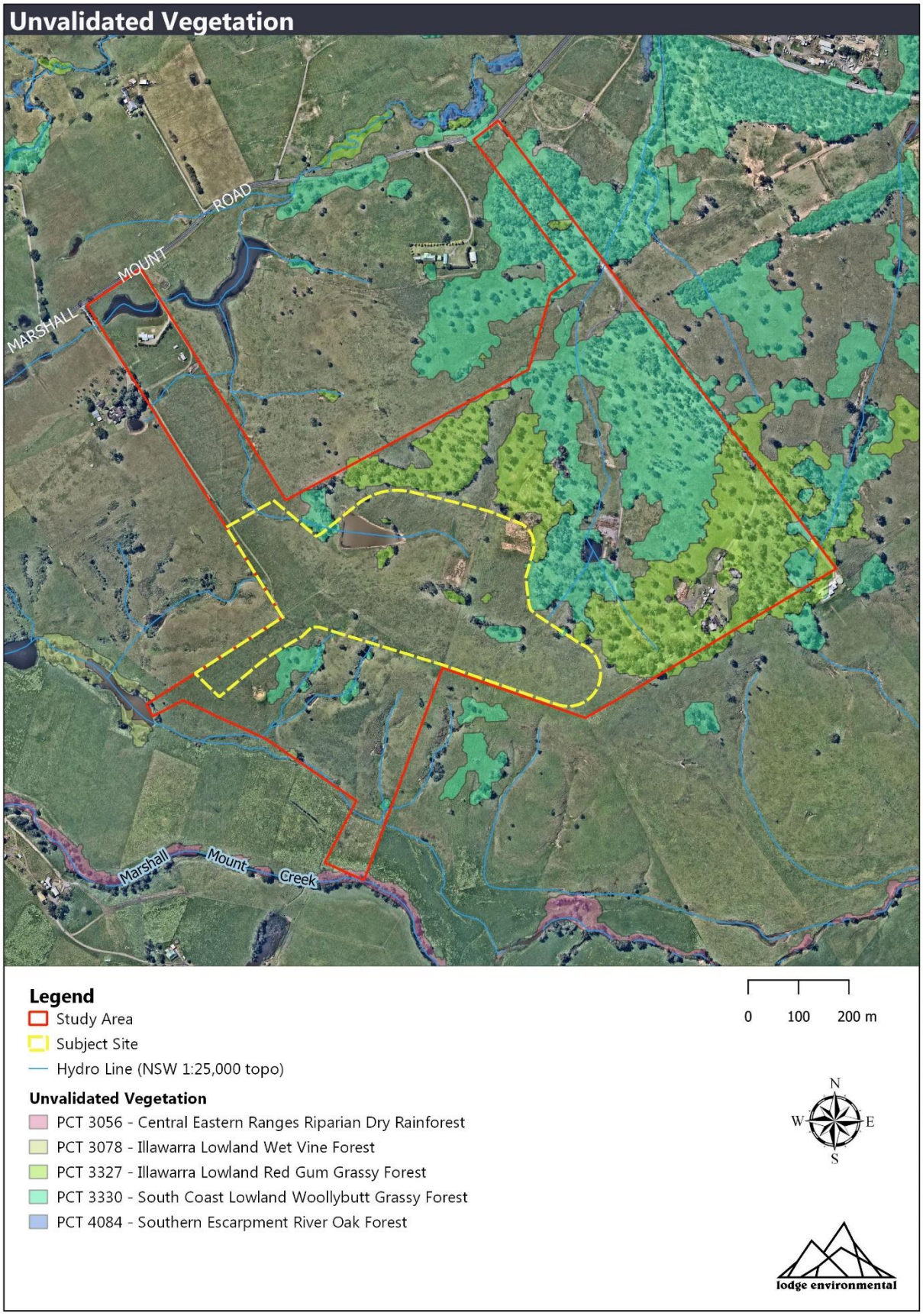


Figure 2: Mapped Plant Community Type within the Study Area

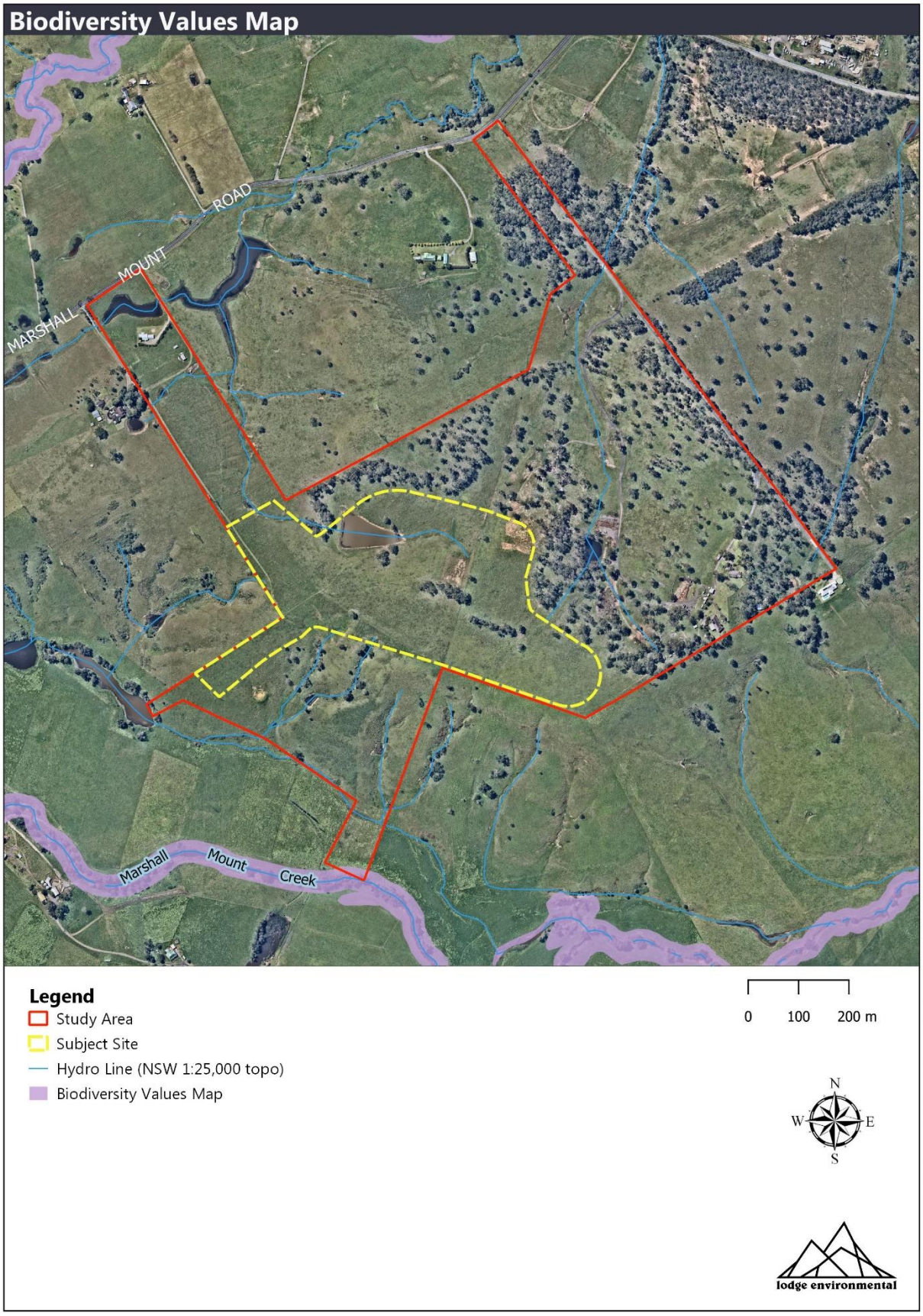


Figure 3: Biodiversity Values Mapping

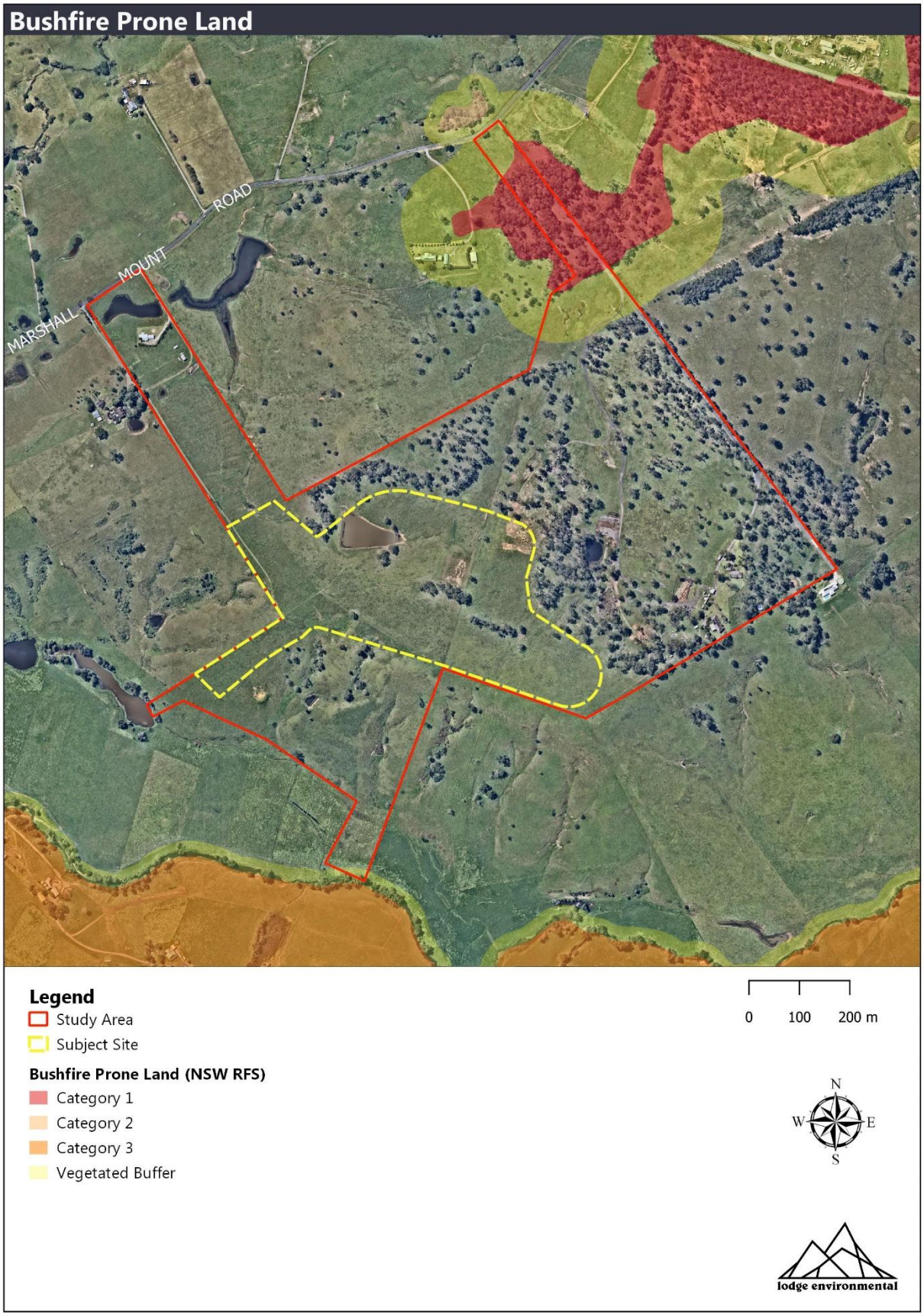


Figure 4: Bushfire Prone Land

4.4 DPE GUIDELINES

The DPE (2022) *Guidelines for Riparian corridors on waterfront land* apply to controlled activities that are regulated under the *Water Management Act 2000* (WM Act).

The Guidelines recommend that a Vegetated Riparian Zone (VRZ) is provided adjacent to a watercourse to provide a protective buffer between catchment land uses and aquatic habitat. This not only helps improve water quality and aquatic habitat but provides habitat for terrestrial and riparian flora and fauna. The VRZ plus the channel width constitute the 'riparian corridor' (**Figure 5**).

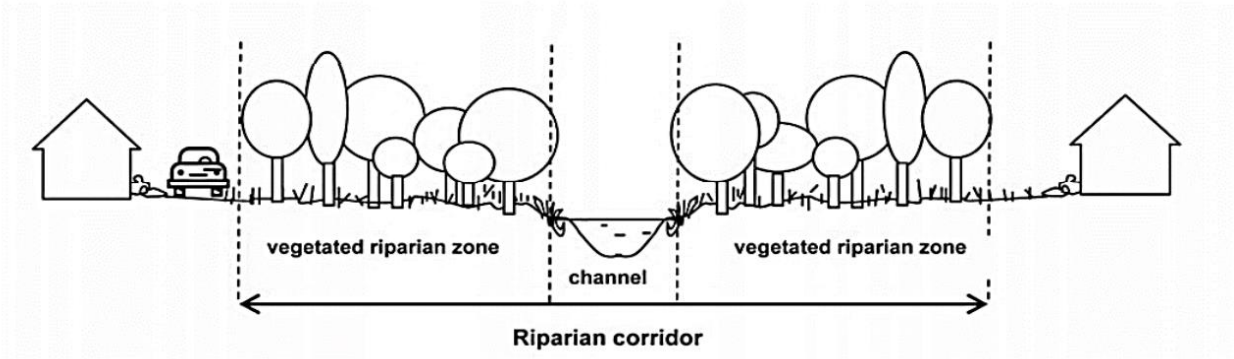


Figure 5: The riparian corridor, comprising a watercourse channel and vegetated riparian zone (DPE 2022)

The width of the VRZ within waterfront land is measured from the top of the highest bank on both sides of the watercourse, and widths are based on watercourse order as classified under the Strahler Stream Order of watercourses as mapped in NSW Hydro Line Spatial Data[1] (**Figure 6**).

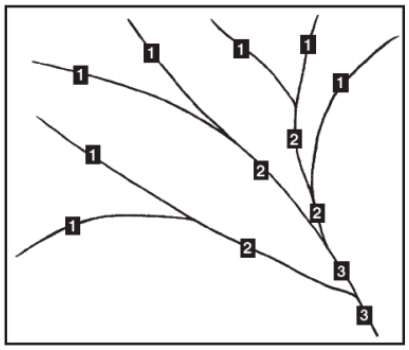
As illustrated in **Figure 7**, according to the NSW Hydro Line spatial data, there is one unnamed watercourse within the Subject Site, which flows in a westerly direction, and eventually to Duck Creek to the north, and then east to Lake Illawarra.

There are several other watercourses in the wider Study Area as follows:

- Two unnamed tributaries of Duck Creek in the western portion of the Study Area;
- A third unnamed tributary of Duck Creek (with two smaller headwater tributaries adjoining) which is located to the north of the Subject Site;
- 3 unnamed tributaries to the south of the Subject Site which flow in a southerly direction and then east towards Marshall Mount Creek.

The Strahler Stream Order system numbers the smallest headwater streams as 1st Order, and stream order increases downstream through the catchment as streams merge and form larger streams (e.g. when two 1st Order streams join they become a 2nd Order).

[1] Authoritative dataset managed by NSW Spatial Services (Department of Finance, Services and Innovation)



Watercourse type	VRZ width (each side of watercourse)	Total RC width
1st order	10 metres	20 m + channel width
2nd order	20 metres	40 m + channel width
3rd order	30 metres	60 m + channel width
4th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80 m + channel width

Figure 6: The Strahler Order System and recommended riparian corridor widths (DPE 2022)

Non-riparian corridor works such as asset protection zones, roads, infrastructure and recreational areas can be authorised by DPE in the outer riparian corridor (outer 50%), so long as an equivalent area connected to the VRZ is offset and the average width of the VRZ is achieved over the watercourse within the site (**Table 2**). The inner 50% of the VRZ must be fully maintained as a functional riparian zone.

Table 2: Riparian corridor matrix

Stream order	Vegetated Riparian Zone (VRZ)	RC off-setting for non RC uses	Cycleways and paths	Detention basins		Stormwater outlet structures and essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1st	10m	•	•	•	•	•	•	•		
2nd	20m	•	•	•	•	•		•		
3rd	30m	•	•	•		•			•	•
4th +	40m	•	•	•		•			•	•

The DPE Guidelines also note that *'where a watercourse does not exhibit the features of a defined channel with beds and banks, the Office of Water may determine that the watercourse is not waterfront land for the purposes of the WM Act'*.

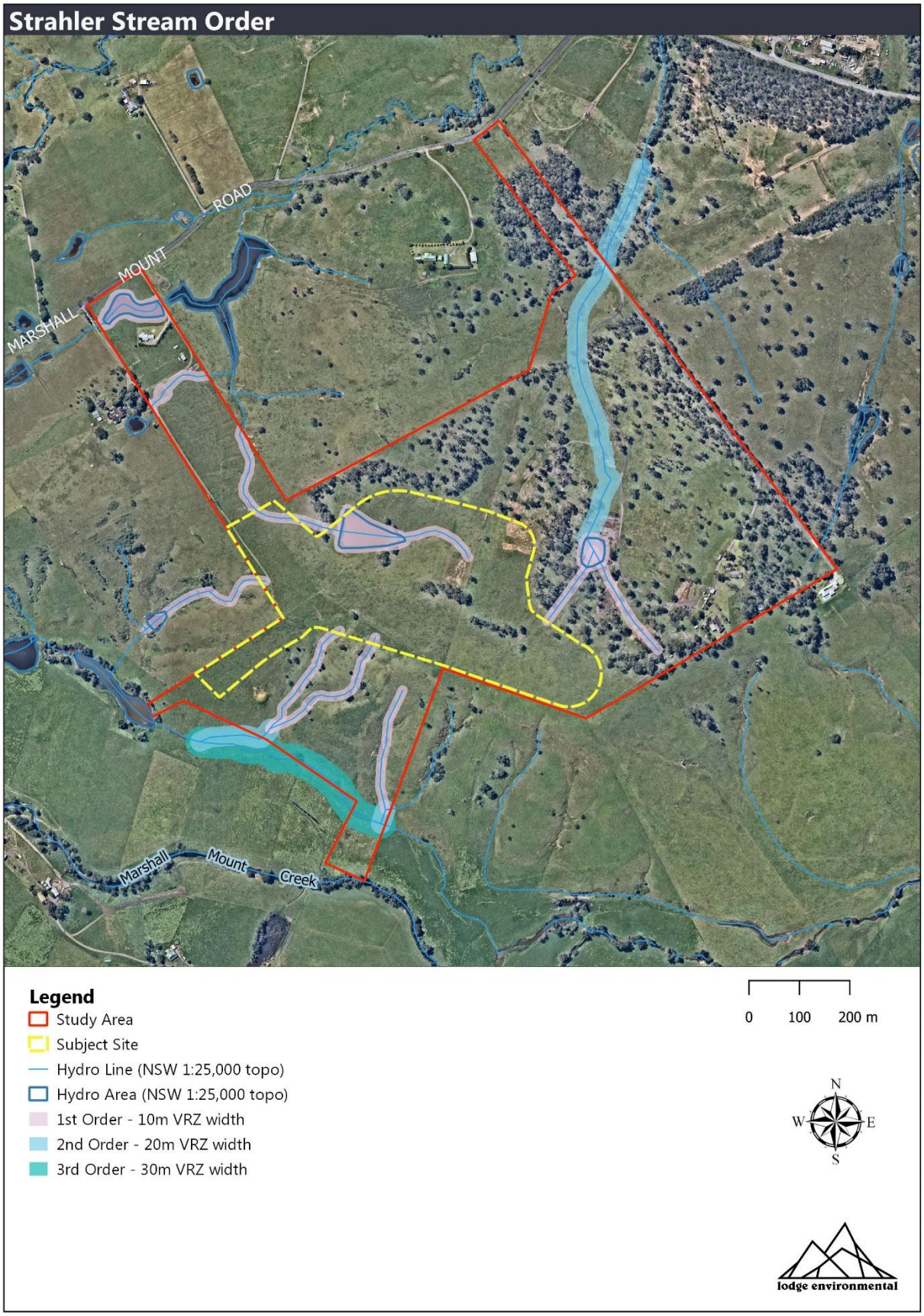


Figure 7: Strahler Stream Orders and VRZ requirements within Study Area

4.5 WOLLONGONG LEP 2009

Land Zoning

The Wollongong Local Environmental Plan 2009 (LEP) is the principal planning instrument for the Wollongong LGA. The LEP sets out the planning framework and establishes the requirements for the use and development of land in the LGA. The LEP provides broad direction with regards to what types of development are permitted within specific land use zones.

The Subject Site is zoned C4- Environmental Living. Four (4) Land Zones were found within the wider Study Area and are detailed in **Table 3** and **Figure 8.**

Table 3: Land Zones within the Study Area

Land Zoning	Objectives
C2- Environmental Conservation	• To protect, manage and restore areas of high ecological, scientific, cultural or aesthetic values. • To prevent development that could destroy, damage, or otherwise have an adverse effect on those values. • To retain and enhance the visual and scenic qualities of the Illawarra Escarpment. • To maintain the quality of the water supply for Sydney and the Illawarra by protecting land forming part of the Sydney Drinking Water Catchment under State Environmental Planning Policy (Biodiversity and Conservation) 2021, Chapter 6, to enable the management and appropriate use of the land by Water NSW.
C3- Environmental Management	• To protect, manage and restore areas with special ecological, scientific, cultural or aesthetic values. • To provide for a limited range of development that does not have an adverse effect on those values.
C4- Environmental Living	• To provide for low-impact residential development in areas with special ecological, scientific, or aesthetic values. • To ensure that residential development does not have an adverse effect on those values.
R2- Low Density Residential	• To provide for the housing needs of the community within a low-density residential environment. • To enable other land uses that provide facilities or services to meet the day to day needs of residents.

Additional Clauses from the Wollongong LEP that apply to the Study Area include:

- Clause 7.2 – Natural Resource Sensitivity – Biodiversity

Portions of the Subject Site are identified as 'Natural resource sensitivity – terrestrial biodiversity'. The objective of this clause is to protect, maintain or improve the diversity and condition of native vegetation and habitat.

- Clause 7.4 – Riparian Land

A number of watercourses in the Study Area are identified as Riparian Land in the Wollongong LEP. The objective of this clause is to ensure that development does not adversely impact riparian land.

Refer **Figure 9.**

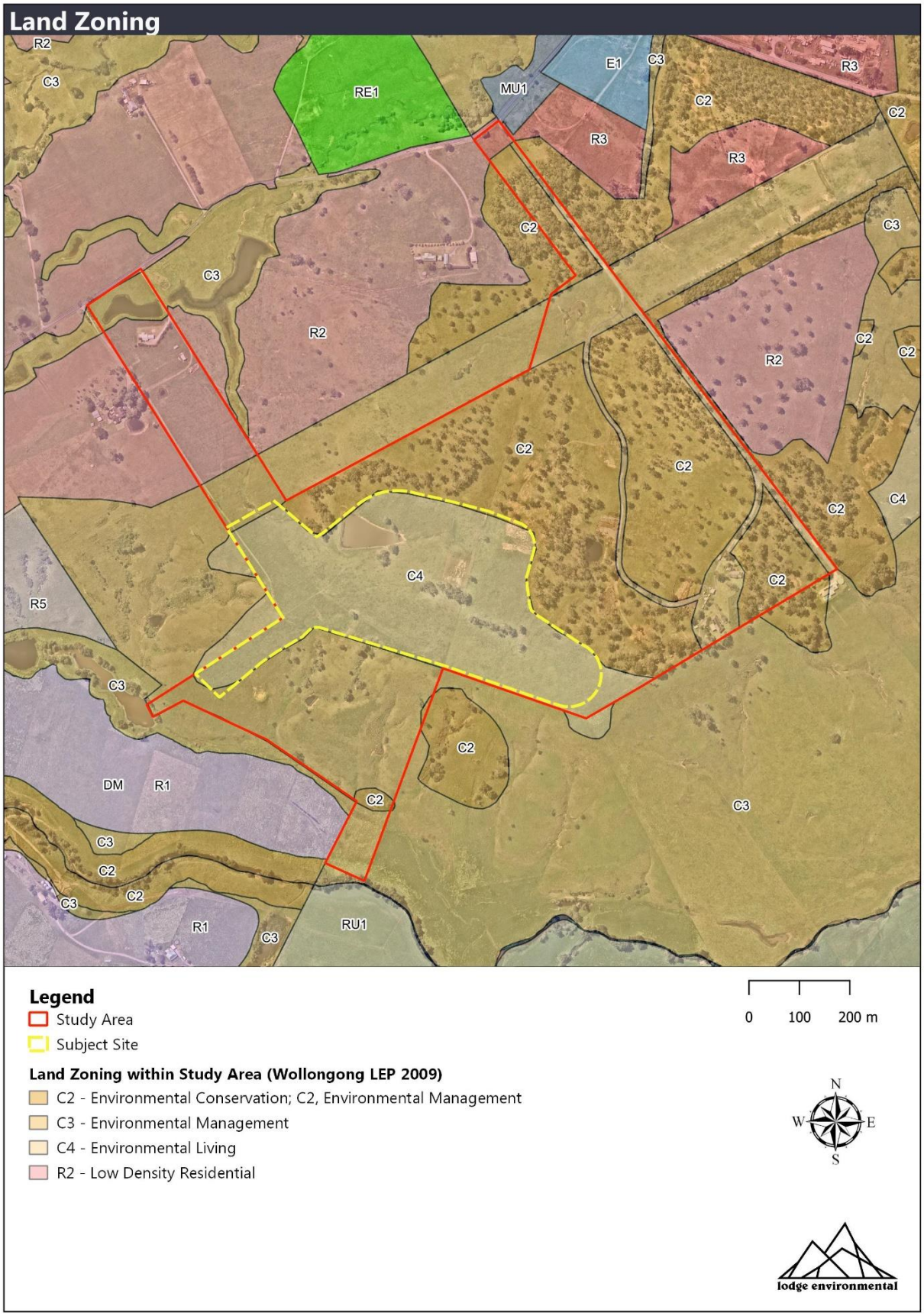


Figure 8: Land Zoning within Study Area

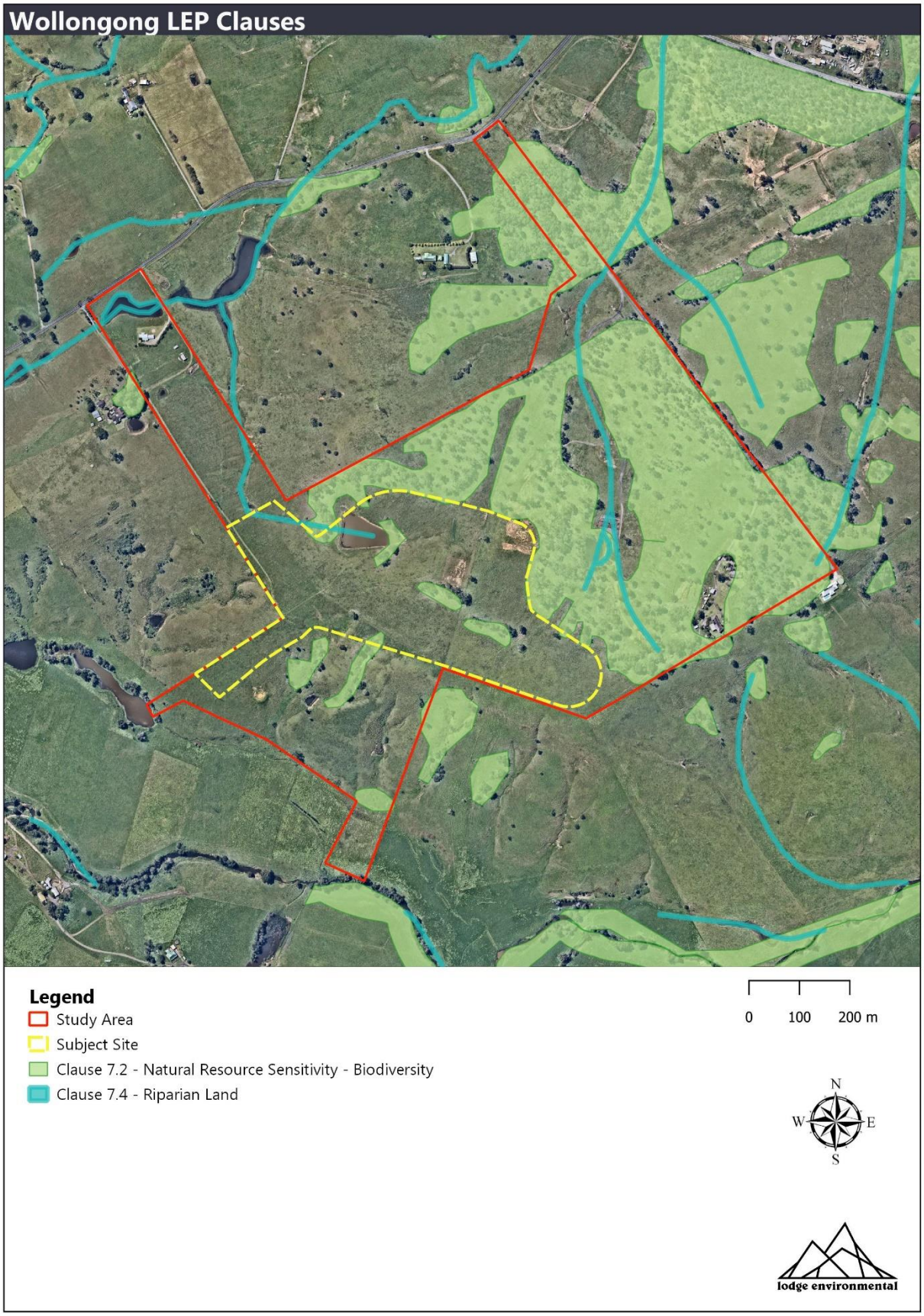


Figure 9: LEP Clauses

4.6 THREATENED FLORA SPECIES

A review of the NSW BioNet Atlas and Protected Matters Search Tool identified 42 threatened plant species listed under the BC Act and/or the EPBC Act that have been previously recorded, or are considered to have habitat, within 10 km of the Study Area (**Figure 10**). This initial compilation of potentially occurring species informed the site survey, providing an indication of which species required consideration within the Study Area (**Appendix C**). While all species listed in **Appendix C** are considered during survey activities, the presence of one (1) threatened species has been recorded within the Study Area. These species exhibit a moderate probability of occurrence within the Study Area and are listed below.

- *Chorizema parviflorum*

4.7 THREATENED FAUNA SPECIES

A review of the NSW BioNet Atlas and Protected Matters Search Tool identified 126 threatened fauna species listed under the BC Act and/or the EPBC Act that have been previously recorded, or are considered to have habitat, within 10 km of the site (**Figure 10**). This initial compilation of potentially occurring species informed the site survey, providing an indication of which species required consideration within the Study Area (**Appendix D**). While all species listed in **Appendix C** are considered during survey activities, the presence of four (4) threatened species have been recorded in close proximity to the Study Area. These species exhibit a moderate probability of occurrence within the Study Area and are listed below.

- *Myotis Macropus* (Southern Myotis)
- *Ninox strenua* (Powerful Owl)
- *Ninox connivens* (Barking Owl)
- *Saccolaimus flaviventris* (Yellow-bellied Sheathtail-bat)

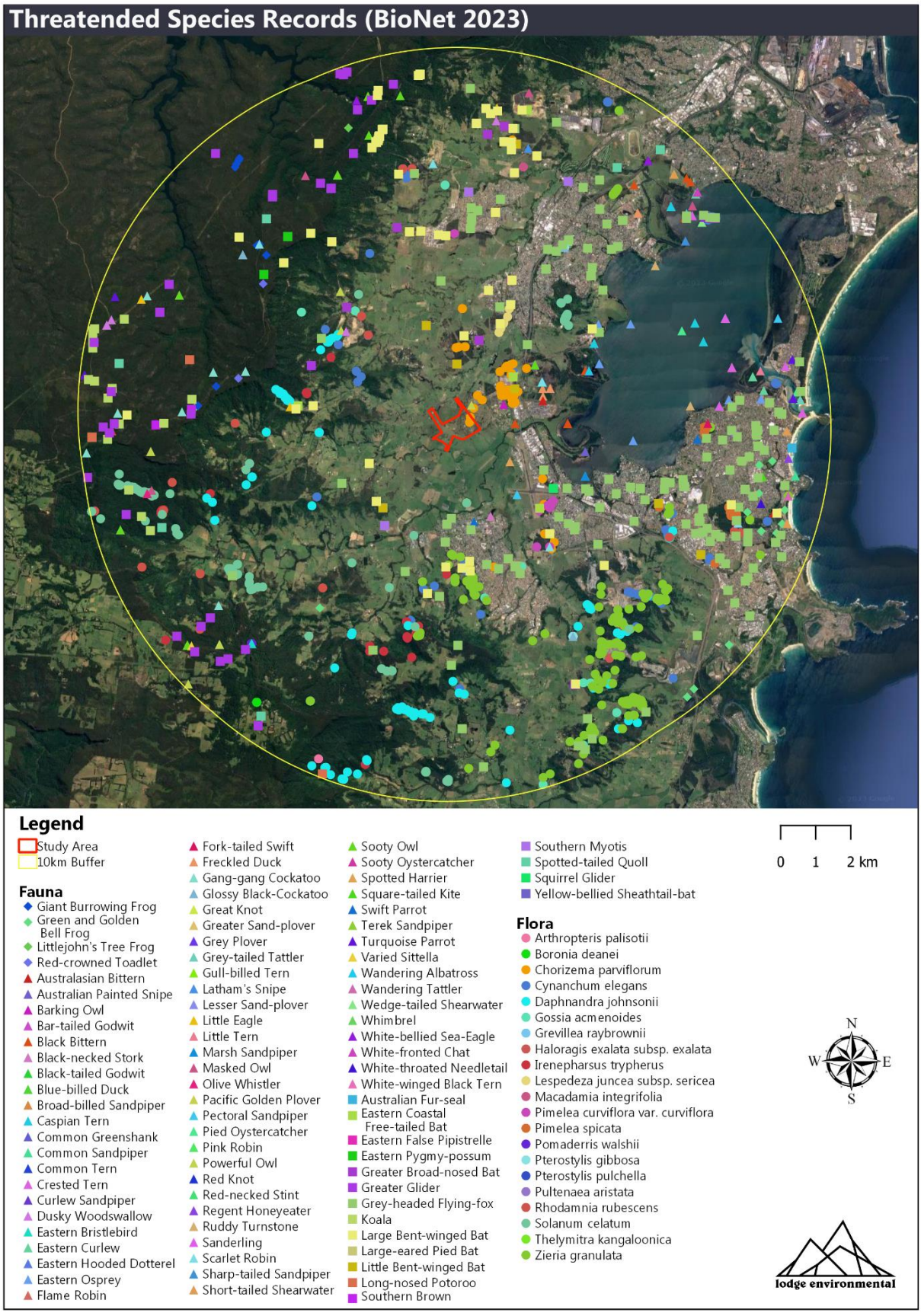


Figure 10: Threatened species recorded within 10km of the Study Area

5.0 FIELD SURVEY RESULTS

5.1 EXISTING ENVIRONMENT AND HABITAT

The Subject Site is a predominately cleared, former agricultural land dominated by pasture grasses and weeds, with scattered patches of native trees present. Small trees and shrubs are largely absent within the Subject Site and small patches of groundcover are focused around the base of upper stratum species.

The Subject Site is considered to provide marginal fauna habitat based on the dominance of exotic species and lack of mature canopy species with Habitat Bearing Trees (HBTs) occurring at low frequencies. Despite the low frequency of HBTs, hollows recorded ranged from small to large and a number of large hollow logs were recorded. The artificial dam located towards the northern boundary of the Subject Site provides suitable habitat to a range of native fauna, primarily amphibian and fish species.

The Subject Site does not contain large boulders, or other notable habitat features.

An overview of the habitat features present within the Study Area are described below in **Table 4**.

Table 4: Habitat features present within the Study Area

Habitat Feature	Description of the feature	Presence of the habitat feature
Habitat-bearing trees	Habitat-bearing trees can be alive or dead (stag) and include any additional sheltering, roosting or nesting features that may be relied upon by native fauna, but are not captured within the traditional definition of a Hollow-bearing tree. These features include; Hollows, crevices, cracks, fissured branches, exfoliating bark, nests, dreys and arboreal termite mounds	Sporadic occurrence of HBTs throughout the native vegetation of the Subject Site. Recorded habitat features included hollows (small, medium and large) and stags.
Small trees and shrubs	Small trees and shrubs, often referred to as the understorey, provides unique niches in the environment animals can utilise for shelter, foraging, and breeding purposes. Smaller birds, for instance, rely on the tangle of branches often found in the understorey to construct their nests, as the dense foliage provides protection from larger predators. Moreover, the understorey also helps stabilise the soils, provide wind protection and prevent the loss of leaf litter.	The Subject Site was largely absent of native small trees and shrubs. Only one individual was recorded within the Subject Site.
Groundcover	Groundcover consists of low shrubs, grasses, herbs and leaf litter. Tall, dense tussock grasses provide important shelter and nesting habitat for a diverse range of animals, including birds, reptiles, marsupials and insects.	Groundcover of the Subject Site was dominated by pasture grasses and exotic species. Small patches of groundcover dominated by native species were present below upper stratum species.
Leaf litter and fallen timber	Leaf litter and plant debris provide important foraging habitat for insects and insectivore species. Hollow logs provide important breeding and shelter habitat for many reptile, frog, mammal and even some bird species.	Leaf litter was noted across the Subject Site, with higher density noted in areas directly adjacent the patches of native vegetation. Large logs were largely absent across the Study Area, however, one patch of native vegetation contained a number of large logs.

Habitat Feature	Description of the feature	Presence of the habitat feature
Waterbodies	Access to water is an essential habitat feature for many animals. While some animals require water only for drinking, others depend heavily on certain aquatic habitats for breeding and foraging. Aquatic ecosystems are home to a diverse array of creatures such as fish, frogs, turtles, platypus, water rats and aquatic invertebrates. These animals use fallen logs, instream rocks and substrate as places to hide, rest and nest. Plants floating on or growing in the water, such as reeds, also provide important breeding, feeding and sheltering areas for waterbirds like pied cormorants and frogs.	A mapped hydroline with a dammed section is present in the northern half of the Subject Site. This waterbody provides suitable habitat amphibians, reptiles and fish and provides suitable foraging habitat for native birds and bats.

5.2 PLANT COMMUNITY TYPES

Due to historic clearing, the Subject Site contained minimal native vegetation and was predominantly exotic pasture grasses. However, native vegetation that remained within the Subject Site was validated as PCT 3327 - Illawarra Lowland Red Gum Grassy Forest which would have historically been present prior to clearance. **Figure 11** illustrates the validated vegetation in the Study Area. The floristic attributes that validated the PCT is further detailed in **Table 5.**

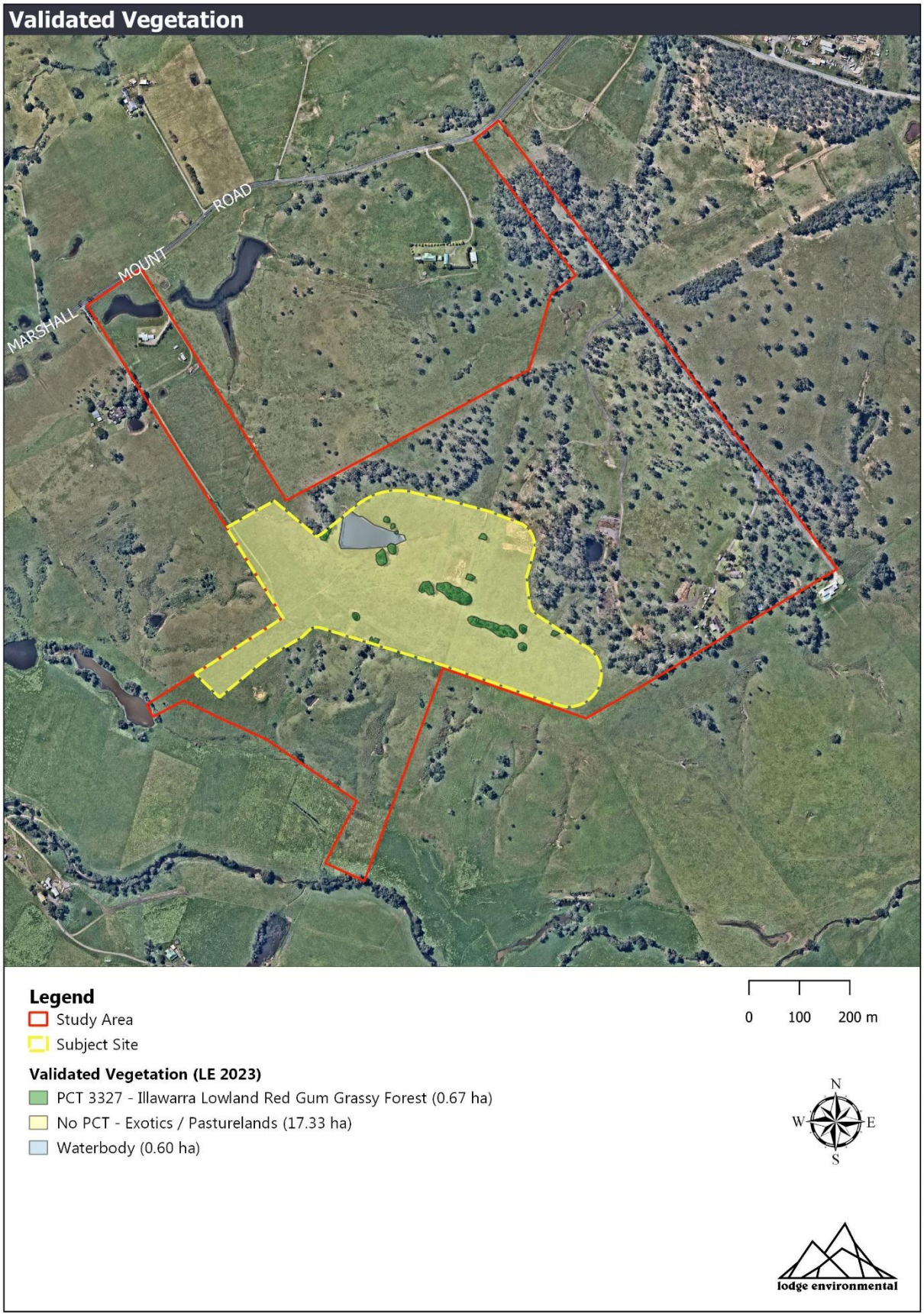


Figure 11: Validated vegetation communities (Lodge Environmental 2023)

PCT 3327 – Illawarra Lowland Red Gum Grassy Forest

Patches of PCT 3327 – Illawarra Lowland Red Gum Grassy Forest within the Subject Site were in poor condition due to the historical clearing leading to fragmentation and weed incursion.

The upper stratum is dominated by *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus euginoides* (Thin-leaved Stringybark). The mid stratum of PCT 3327 within the Subject Site is largely absent. The only midstratum species recorded within the Subject Site was *Streblus brunonianus* (Whalebone Tree). Ground stratum vegetation is dominated by grass or grass-like species and ferns, including *Cymbopogon refractus* (Barbed Wire Grass), *Dichelachne micrantha* (Shorthair Plumegrass), *Echinopogon ovatus* (Hedgehog Grass), *Entolasia stricta* (Wiry Panic), *Fimbristylis dichotoma* (Common Fringe Sedge), *Microlaena stipoides* (Weeping Grass) and *Cheilanthes sieberi* (Narrow Rock-fern). Forb species recorded within the ground stratum included *Centella asiatica* (Gotu Kola), *Commelina cyanea* (Scurvey Weed), *Dichondra repens* (Kidney Weed), *Hypoxis hygrometrica* (Golden Weather-grass) and *Pratia purpurascens* (Whiteroot).

PCT 3327 is further detailed in **Table 5**.

Table 5: PCT 3327 Justification Table

PCT 3327 – Illawarra Lowland Red Gum Grassy Forest	
PCT ID	3327
Vegetation Formation	Grassy Woodlands
Vegetation Class	Coastal Valley Grassy Woodlands
PCT Generic Descriptor	A very tall sclerophyll open forest with a mid-stratum of soft-leaved shrubs and small trees, with a grassy ground layer on the foothills of the Illawarra coast. The canopy almost always includes *Eucalyptus tereticornis*, which is very frequently associated with stringybark eucalypts (*Eucalyptus eugenioides* or *Eucalyptus globoidea*). A sparse shrub to small tree layer almost always includes one or more species of acacias, of which *Acacia maidenii* is the most frequent, commonly with *Breynia oblongifolia.* The mid-dense ground cover typically includes forbs, grasses, twiners and a sedge, very frequent species including *Dichondra repens, Geitonoplesium cymosum, Pandorea pandorana* subsp. *pandorana, Carex longebrachiata, Desmodium varians* and *Microlaena stipoides.* This PCT has a relatively restricted distribution from Lake Illawarra south of Wollongong to Bomaderry on the Shoalhaven River. It occurs at low elevations of below 180 metres asl on wet coastal foothills, where mean annual rainfall typically exceeds 1100 mm. It primarily occurs on Shoalhaven Group sediments, often on the Broughton Formation. It is related floristically to PCT 4052, which is another coastal red gum forest occurring on undulating hills from Conjola to Bega. This community grades spatially into PCT 3330 which occurs on low elevation flats with somewhat impeded drainage and commonly includes Eucalyptus longifolia and Melaleuca decora.
Condition in Subject Site	Poor condition
Survey Effort	Random meander.

PCT 3327 – Illawarra Lowland Red Gum Grassy Forest			
PCT Justification: **Species present within Subject Site**	Upper Stratum: *Eucalyptus eugenioides* *Eucalyptus tereticornis*	Mid Stratum: *Streblus brunonianus*	Ground Stratum: *Bothriochloa macra* *Centella asiatica* *Cheilanthes sieberi* *Commelina cyanea* *Cymbopogon refractus* *Cyperus polystachyos* *Dichelachne micrantha* *Dichondra repens* *Echinopogon ovatus* *Entolasia stricta* *Fimbristylis dichotoma* *Geranium solanderi* *Glycine microphylla* *Glycine tabacina* *Hypoxis hygrometrica* *Juncus usitatus* *Lomandra multiflora* *Microlaena stipoides* *Pratia purpurascens* *Wahlenbergia gracilis*
TEC Status	There are two TECs associated with this PCT, being: Endangered BC Act- Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion – Endangered under the BC Act Illawarra and south coast lowland forest and woodland ecological community – Critically Endangered under the EPBC Act		
PCT 3327 in poor condition	 **Figure 12: Remnant Bushland within Subject Site**		

Cleared land and exotic pasture species

The majority of the Subject Site was predominantly cleared with only scattered stands of native tree species. Mid stratum was absent with ground stratum being predominantly exotic and weed species. *Cenchrus clandestinus* (Kikuyu), *Eragrostis leptostachya* (Paddock Lovegrass), *Paspalum orbiculare* (Ditch Millet)*, Sporobolus africanus* (Parramatta Grass) was the dominant exotic species throughout the Subject Site (**Figure 13**). Other notable weeds that were scattered throughout the Subject Site included *Araujia sericifera* (Moth Vine), *Bidens pilosa* (Cobblers Peg), *Gomphocarpus physocarpus* (Balloon Cotton Bush), *Lantana camara* (Lantana), *Rubus fruticosus* (Blackberry) and *Senecio madagascariensis* (Fireweed).

Figure 13: Exotic pasture grasses found within Subject Land

5.3 THREATENED ECOLOGICAL COMMUNITY

Threatened Ecological Communities (TEC) are ecological communities that are at the risk of extinction from a number of pressures, including:

- Clearing of native vegetation
- Inappropriate fire regimes
- Exotic and/or invasive species
- Climate change
- Water diversion
- Pollution

- Urban development.

TECs are afforded considerable protection via their listing under both the State BC Act and Commonwealth EPBC Act.

PCT 3327 – Illawarra Lowland Red Gum Grassy Forest can be associated with two TECs, outlined in **Table 6**.

Table 6: PCT 3327 – Illawarra Lowland Red Gum Grassy Forest TEC associations

PCT	Associated TEC	BC Act	EPBC Act
3327	Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion	Endangered	-
	Illawarra and South Coast Lowland Forest and Woodland Ecological Community	-	Critically Endangered

5.3.1.1 Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion

Consideration under the BC Act requires the vegetation community to align with the definition of the TEC under NSW Scientific Committee Final Determination. The Illawarra Lowlands Grassy Woodland TEC is defined as:

- Occurring within the local government areas of Wollongong City, Shellharbour City and Kiama Municipality.
- Including the Yallah Woodland and Mills' (1997) communities of the Floodplains, communities of the Ridges and Slopes (Dry communities) and communities of the lower escarpment (Moist communities) but not including Floodplain Communities dominated by *Casuarina* species or rainforest on latite soils.
- Having characteristic tree species being *Eucalyptus tereticornis*, *Eucalyptus eugenioides*, *Eucalyptus longifolia*, *Eucalyptus bosistoana* and *Melaleuca decora*.
- Occurring on relatively gently sloping to undulating lands less than about 200 m elevation on Berry Siltstone, Budgong Sandstone and Quaternary alluvium.

Given that the fragmented area of PCT 3327 the Subject Site meets the above definition, the occurrence PCT 3327 – Illawarra Lowland Red Gum Grassy Forest within the Subject Site is considered to represent the TEC form in accordance with the BC Act.

5.3.1.2 Illawarra and South Coast Lowland Forest and Woodland Ecological

Consideration under the EPBC Act requires the vegetation community to align with the definition of the TEC under the Commonwealth Threatened Species Scientific Committee Final Determination, being:

- The ecological community occurs within the state of New South Wales in the Jervis, Ettrema and Illawarra subregions of the Sydney Basin Bioregion and the Bateman subregion of the South East Corner Bioregion.
- The ecological community occurs between 5 and 350 m asl, on the coastal plain or foothills between the immediate coastal strip and the escarpment.
- The ecological community is a woodland with at least 10% canopy cover.

- *Eucalyptus tereticornis* (Forest Red Gum) is always present in the mature tree canopy. Other characteristic tree canopy species include: *Angophora floribunda* (Rough-barked Apple); *Eucalyptus bosistoana* (Coast Grey Box); *Eucalyptus botryoides* (Bangalay); *Eucalyptus eugenioides* (Thin-leaved Stringybark); *Eucalyptus globoidea* (White Stringybark); *Eucalyptus longifolia* (Woollybutt); and/or *Eucalyptus quadrangulata* (Coastal White Box).
- The understorey varies between sites and contains: a ground layer of grasses, herbs and sedges to a height of approximately 1 m and/or a shrubby layer to a height of approximately 2 m.
- The ecology community may include of drainage lines and periodically inundated areas, but typically occurs in locations less subject to regular or long term inundation than two nearby ecological communities 'River-flat eucalypt forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions' and 'Swamp sclerophyll forest on coastal floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions
- A sub-canopy of *Melaleuca decora* (Paper Bark), *M. ericifolia* (Swamp Paper Bark), *M. styphelioides* (Prickly-Leaved Tea Tree), tree-sized Acacias and/or *Casuarina glauca* (Swamp Oak) is often present.
- The ecological community occurs on a variety of substrates, most commonly fine grained sedimentary or plutonic rocks, from which sandy loam to loam soils with moderately high fertility are derived.
- The ecological community is not likely to be present where there is:
    - a high abundance of, or any layer dominated by rainforest-associated plant species, particularly palms or tree ferns
    - a high abundance of plant species associated with coastal sands
    - *Corymbia maculata* (Spotted Gum) dominant in the canopy.
- It does not typically occur:
    - on infertile sandy soils, basic volcanic soils or primary alluvium
- The patch is at least 0.5 ha and 30-50% of its total perennial understory vegetation cover is comprised of native species with at least 6-10 native plant species per 0.5 ha in the ground layer (for moderate condition)
- The ecological community is not dominated by rainforest-associated plant species, particularly palms or tree ferns.

Given that the fragmented area of PCT 3327 within the Subject Site does not meet the above definition (the understory contained a high percentage of invasive species/weed cover), the occurrence of PCT 3327 is not considered to represent the TEC form in accordance with the EPBC Act.

5.4 WATERCOURSES AND RIPARIAN CORRIDORS

Clause 7.4 of the WCC Local Environmental Plan (LEP) 2009 states that development consent must not be granted for development on land to which this clause applies unless the consent authority has considered the impact of the proposed development on the land and any opportunities for rehabilitation of aquatic and riparian vegetation and habitat on that land. Considerations must also be made to the relevant components of Chapter E23 of the Wollongong Development Control Plan (DCP) 2009, which applies the "Objective Setting" methodology for applying minimum Core Riparian Zone widths according to the category of the watercourse.

Table 7 below shows the minimum width requirements for riparian corridors according to Council's DCP.

Table 7: Minimum Width Requirements for Riparian Corridors (WCC DCP 2009)

Watercourse Category	Minimum Core Riparian Zone Width (each side of watercourse)	Minimum Vegetated Buffer Width (each side of watercourse)	Minimum Total Riparian Corridor Width
Category 1	40 metres	10 metres	100 metres + channel width
Category 2	20 metres	10 metres	60 metres + channel width
Category 3	10 metres	–	20 metres + channel width

As illustrated in

Figure **14**, one unnamed 1st Order stream and associated farm dam is located within the northern portion of the Subject Site and is identified by the DCP as a Category 3 watercourse. Therefore, a minimum Core Riparian Zone of 10 metres each side of the watercourse is required, and an additional minimum Vegetated Buffer is not required for this category.

The overall objectives of Category 3 is to minimise sedimentation and nutrient transfer to provide bank stability, improve water quality and protect native vegetation. Category 3 often applies to open channels with limited engineering and very little remnant vegetation. In areas where natural values are limited, a riparian corridor consisting of flood appropriate vegetation is important to ensure a flood hazard free overland flow path. The broad objectives of this category are to:

- Minimise sedimentation and nutrient transfer;
- Provide bank stability;
- Protect water quality;
- Protect riparian vegetation, wherever possible;
- Emulate a naturally functioning stream with a suitable riparian corridor width;
- Provide suitable vegetated habitat refuges for terrestrial and aquatic fauna, wherever possible;
- Treat stormwater run-off outside the riparian corridor before discharge into the riparian zone, wherever possible.

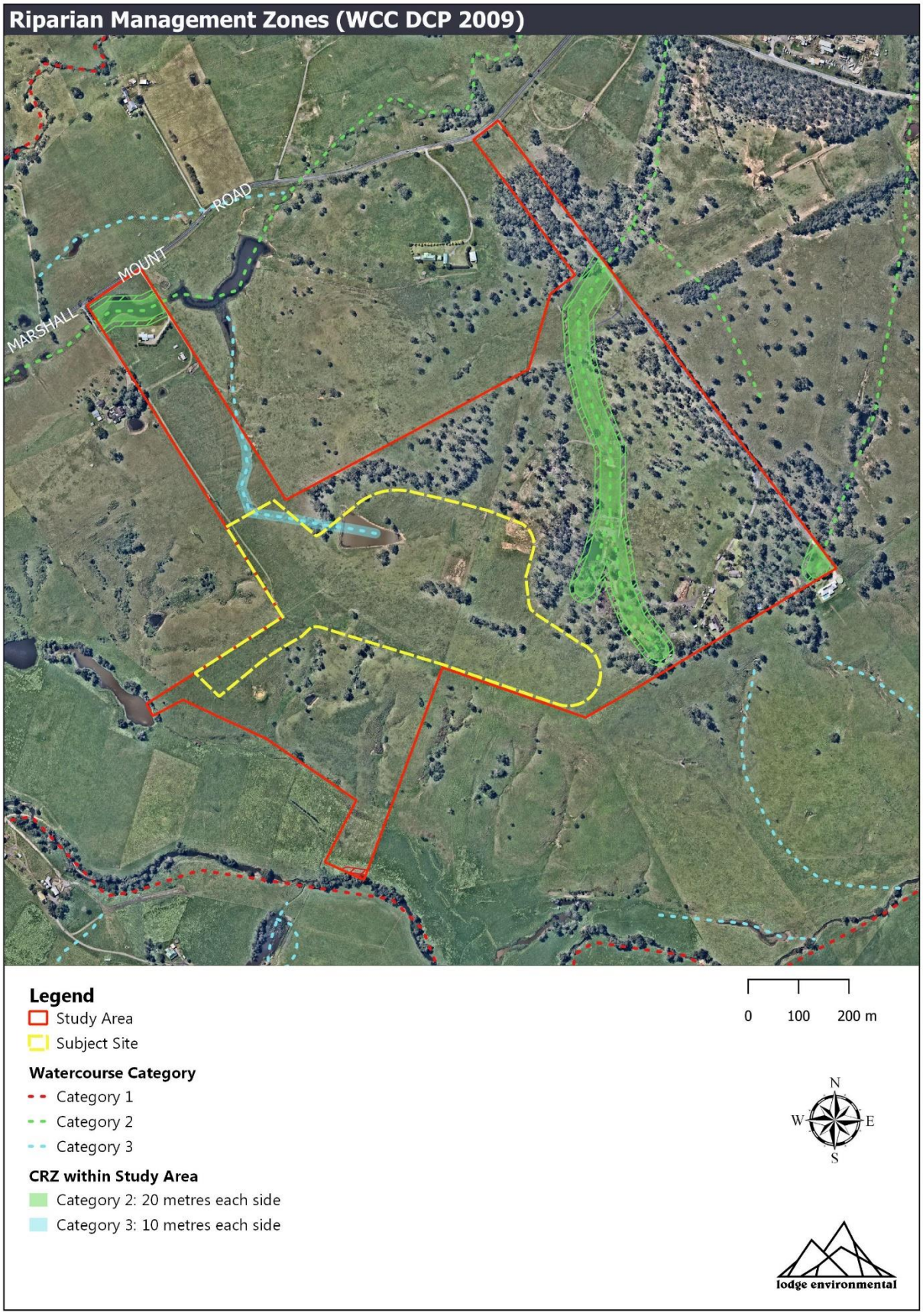


Figure 14: Watercourse Categories and CRZ widths according to Wollongong DCP 2009

Council may consider a variation to the minimum riparian corridor width for proposals involving alterations or additions to an existing building which is already located within the prescribed riparian corridor width or in other exceptional circumstances where, in the opinion of Council, the variation will not result in any adverse impact upon the functions of the riparian corridor or any adverse flood hazard risk or other hazard risk. However, the absolute minimum riparian corridor width shall be 10 metres from the top of bank. This is generally consistent with the general 10 metre 'high flood risk precinct' as defined in the Floodplain Management Chapter of this DCP.

Any proposed variation to the minimum riparian corridor width requirements would also require appropriate negotiations to occur directly with the NSW Government branch responsible for administering the WM Act, currently being the Natural Resources Access Regulator (NRAR), prior to the lodgement of any Integrated Development Application.

It is further noted that a Vegetation Management Plan (VMP) will be required to be submitted with any Integrated Development Application or Development Application lodged for any proposed development within 40 metres from the top of bank of any watercourse, lake or estuary.

5.5 FLORA

A total of 56 species were recorded during the site inspection (26 native and 29 exotic). A species list is provided in **Appendix A**.

5.5.1 Threatened Flora Species

There were no threatened flora species identified within the Subject Site. The Subject Site is considerably degraded. Potential occurrence of threatened flora species is considered very low.

5.6 FAUNA

A total of 14 fauna species were identified within the site. A species list is included in **Appendix B**. Targeted surveys were not conducted as part of this assessment.

5.6.1 Threatened Fauna Species

There were no threatened fauna species identified within the site.

In general, the habitat potential of the proposed development site has been reduced through ecosystem simplification and a long history of landscaping, rural land-use and human occupation. This has depleted natural resources such as food and shelter for native animals.

The following observations were noted:

- There is a low diversity of species and low structural diversity across the majority of the Subject Site to provide a greater diversity and abundance of micro habitats.
- There are few mature trees containing hollows (HBTs).
- No nests were identified within the Subject Site.
- Introduced species have replaced native species thereby reducing food resources and shelter sites.

- There are no rocks, caves, overhangs or crevices to provide habitat.
- There are several creeks and four dams to provide habitat, particularly for amphibian species.
- There are several dilapidated structures to provide marginal microbat habitat.
- There is minimal juvenile recruitment of trees or shrubs occurring.

In general, the habitat potential of the Subject Site for specialist native species, such as listed threatened species is poor.

6.0 BIODIVERSITY OFFSET SCHEME ENTRY

Entry into the Biodiversity Offset Scheme (BOS) is triggered by developments, projects and activities that exceed certain thresholds for significant impacts on biodiversity. The thresholds are:

- Clearing over the relevant native vegetation clearance threshold associated with the proposed minimum lot size.
- Clearance of native vegetation mapped on the Biodiversity Values Map.
- Significant impacts to matters listed under the BC Act as assessed using s7.3 of the BC Act.

Should any future development trigger one of the above listed thresholds, entry into the BOS would be required through the completion of a Biodiversity Development Assessment Report (BDAR).

6.1 NATIVE VEGETATION CLEARANCE THRESHOLD

The native vegetation clearing thresholds are related to the proposed minimum lot size for proposed developments, as outlined in **Table 8.** As the proposed minimum lot size for the residential subdivision is 1,000 m^2, native vegetation clearance of up to 0.25 ha may be permissible within the Subject Site without triggering entrance into the BOS.

Table 8: Offset scheme thresholds - area criteria

Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme applies
Less than 1 ha	0.25 ha or more
1 ha, and less than 40 ha	0.5 ha or more
40 ha, and less than 1,000 ha	1 ha or more
1,000 ha or greater	2 ha or more

Assuming all native vegetation within the Subject Site requires removal, the total area of clearing would equal 0.67 ha. Under the current subdivision plans, the native vegetation clearance threshold is exceeded and entrance into the BOS would be required.

6.2 BIODIVERSITY VALUES MAP

As illustrated in Section 4.2, there is a small portion of the State Biodiversity Values Map that occurs within the Study Area, however it is outside the Subject Site. Accordingly, under the current subdivision plans, the Biodiversity Values Map entrance threshold is not triggered.

6.3 SIGNIFICANT IMPACTS TO MATTERS LISTED UNDER THE BC ACT

Significant impacts to matters listed under the BC Act would be determined via an Assessment of Significance (AoS). Necessary AoS would allow for any potential significant impact on a threatened species or community to be determined. The Subject Site contains the following Threatened Ecological Community, listed under the BC Act:

- Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion

Impacts to this Threatened Ecological Community, including thinning or clearance of vegetation associated with the proposed subdivision, would be subject to an Assessment of Significance.

If associated impacts are deemed significant, entrance into the BOS may be required. Prior to entrance into the BOS, avoidance strategies would be discussed, with the overall aim of avoiding impacts on this Threatened Ecological Community.

7.0 ECOLOGICAL CONSTRAINTS

Ecological values identified through the literature review and field survey were ranked on a scale of high, moderate, and low based on the level of ecological value and legislative protection. The constraint levels and relevant attributes recorded within the Study Area are shown in **Figure 15** detailed in **Table 9**.

Table 9: Ecological Constraints within the Subject Site

Constraint Level	Description/Activity
High	• Clearance of native vegetation in exceedance of the BOS threshold of 0.25 ha or more under the proposed lot sizes. • Threatened Ecological Community impact.
Moderate	• Native vegetation impact below BOS entrance threshold. • Impacts to identified habitat features (HBTs, waterbodies, logs). • Impacts to Riparian Lands.
Low	• Impacts on cleared land. • Removal of any exotic vegetation.

High Constraints

Designing and planning any future development within the Study Area, impacts to areas considered as a 'High' ecological constraint should be avoided or limited. Impacts within the mapped high ecological constraint require the consenting authority to consider the degree to which the proposal has implemented the hierarchical approach of avoidance, minimise and then offsets. Efforts to avoid and minimise impacts to native vegetation and TECs, through proposal design, are considered by the consenting authority.

Clearance or impact to native vegetation associated with any future development within the Subject Site totalling 0.25 ha or more will require entrance into the Biodiversity Offset Scheme (BOS). Similarly, significant impacts to native vegetation associated with the TEC Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion may trigger entrance into the BOS. All native vegetation impact (i.e. clearance for building footprints, access roads, hardstand areas, etc) count towards the BOS impact threshold.

Moderate Constraints

Impacts to native vegetation below the BOS entrance threshold of 0.25 ha is considered as a 'Moderate' constraint. Future development design and planning should aim to retain areas of better condition patches or patches of native vegetation that have the potential to act as a habitat corridor. The Subject Site is considered to provide marginal fauna habitat based on the dominance of exotic species and lack of mature canopy species. However, a number of habitat features were identified, including HBTs, logs and an artificial dam. Efforts to avoid impact to habitat features are considered by the consenting authority. Where avoidance is not feasible, mitigation measures such as compensatory habitat and fauna relocation is recommended.

The current design of the proposed subdivision works encroaches upon the Riparian Zone and Vegetation Buffer of the unnamed 1st Order stream in the northern portion of the Subject Site, mapped as a Category 3 stream under the WCC DCP. Future development design and planning requires considerations to Chapter E23 of the WCC DCP. Weeds and exotics adjacent to the riparian zone must be managed through implementation of a Vegetation Management Plan (VMP), prepared by a suitably qualified environmental consultant and in accordance with WCC requirements. A VMP would introduce the opportunity to both protect and enhance the riparian corridor and ensure adequate consideration of vegetation buffer zones.

Low Constraints

Areas of vegetation that are currently cleared or representative of exotic pasture, are considered to present low ecological constraints. Any future development will need to consider measures to limit the spread of weeds and other exotic vegetation.

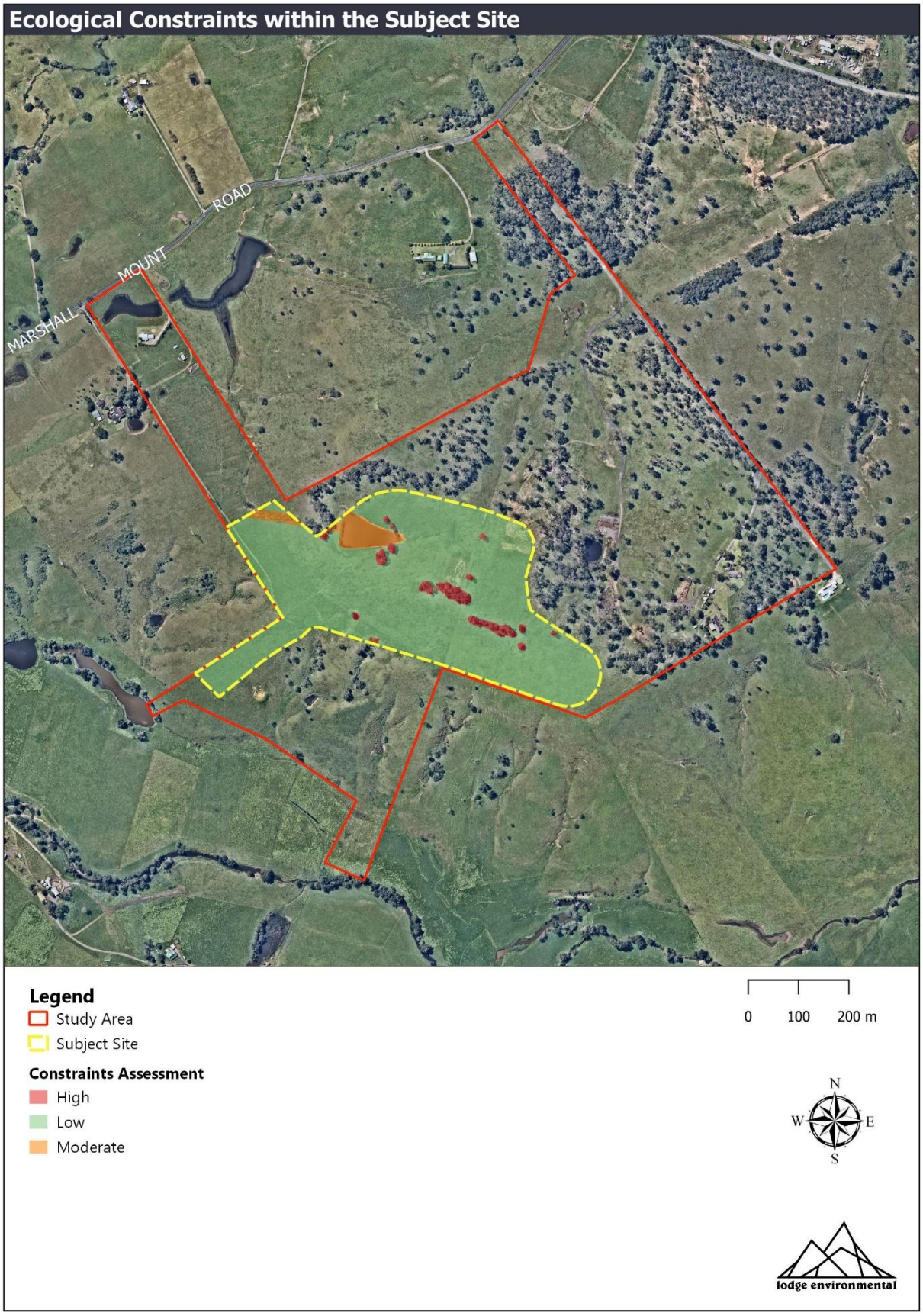


Figure 15: Ecological constraints within the Subject Site

8.0 CONCLUSION

Lodge Environmental has conducted a preliminary assessment of the biodiversity values present at 297 and 365 Marshall Mount Road, Marshall Mount NSW, 2530 to determine notable constraints in the context of future development opportunities.

The Subject Site is a predominately cleared, former agricultural land dominated by pasture grasses and weeds, with scattered patches of native trees present. The native vegetation is consistent with PCT 3327 - Illawarra Lowland Red Gum Grassy Forest and the TEC Illawarra Lowlands Grassy Woodland in the Sydney Basin Bioregion. No threatened flora or fauna were recorded. Targeted surveys were not conducted for threatened species.

A BDAR, in line with the Biodiversity Assessment Method 2020, will be required to accompany a future Development Application if future development exceeds the BOS entrance clearance threshold of 0.25 ha or is considered to be a significant impact to a threatened species/ecological community and/or their habitat.

Entry into the Biodiversity Offset Scheme may be avoidable if the following two thresholds of relevance to the Study Area are not triggered:

- Native vegetation clearance equal to or greater than the associated threshold of 0.25 ha.
- Significant impacts on listed matters listed under the BC Act as determined via an Assessment of Significance.

If entrance into the BOS can be avoided, a Flora and Fauna Assessment (FFA) will still be required to accompany a future Development Application.

High, moderate and low ecological constraints have been identified as part of this report and must be considered for any development plans. Retention of native vegetation within future subdivision designs is recommended.

9.0 REFERENCES

Department of Climate Change, Energy, the Environment and Water (2022). *Protected Matters Search Tool*. Accessed April 2023.

Department of Planning and the Environment (DPE) (2022). *NSW State Vegetation Type Map.* Accessed April 2023.

Department of Planning the Environment (DPE) (2023). *SEED: The Central Resource for Sharing and Enabling Environmental Data in NSW.* Accessed April 2023. *Available at https://www.seed.nsw.gov.au/*

Google Earth (2023). Accessed April 2023. Available at earth.google.com/web/

Landcom (2004). Soils and Construction Volume 1 Managing Urban Stormwater., 4th Edition, March 2004.

Lodge Environmental (2021). Flora and Fauna Assessment – 365 (and 297) Marshall mount Road, Marshall Mount. Prepared for Maker Engineering, June 2021.

NearMap (2023). Accessed April 2023. *Available at https://www.nearmap.com/au/en/*

Office of Environment and Heritage (OEH) (2021). Threatened species profiles. Accessed April 2023. *Available at https://www.environment.nsw.gov.au/threatenedspeciesapp/*

Pellow, B.J., Henwood, M.J. and Carolin, R.C. (2009). Flora of the Sydney Region. Sydney University Press. 5th Edition.

PlantNET (The NSW Plant Information Network System). Royal Botanic Gardens and Domain Trust, Sydney. Accessed April 2023. *Available at https://plantnet.rbgsyd.nsw.gov.au*

Robinson, L. (2003). Field Guide to the Native Plants of Sydney. Simon and Schuster.

Rose, H. and Rose, C. (2016). Pasture weeds of coastal NSW. Department of Primary Industries (DPI).

Wollongong City Council (WCC) (2023). Online Maps – Available at:

https://wcc.spatial.t1cloud.com/spatial/IntraMaps/?project=Public_Wollongong&module=Planning%20%26%20Environment%20Map&configId=3a2fbdc5-a9e4-4323-b27d-6e522a1ed8ad&startToken=bf288a50-1e0e-45cc-8c8c-cdc0a61dba3d

10.0 LIMITATIONS

This report and the associated services performed by Lodge Environmental are in accordance with the scope of services set out in the contract between Lodge Environmental and the Client. The scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to Site.

Lodge Environmental derived the data in this report primarily from visual inspections, and, limited survey and analysis made on the dates indicated. In preparing this report, Lodge Environmental has relied upon, and presumed accurate, certain information provided by government authorities, the Client and others identified herein. The report has been prepared on the basis that while Lodge Environmental believes all the information in it is deemed reliable and accurate at the time of preparing the report, it does not warrant its accuracy or completeness and to the full extent allowed by law excludes liability in contract, tort or otherwise, for any loss or damage sustained by the Client arising from or in connection with the supply or use of the whole or any part of the information in the report through any cause whatsoever.

The data, findings, observations, conclusions and recommendations in the report are based solely upon the state of the Site at the time of the investigation. The passage of time, manifestation of latent conditions or impacts of future events (e.g. changes in legislation, scientific knowledge, land uses, etc) may render the report inaccurate. In those circumstances, Lodge Environmental shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of the report.

This report has been prepared on behalf of and for the exclusive use of the Client and is subject to and issued in connection with the provisions of the agreement between Lodge Environmental and the Client. Lodge Environmental accepts no liability or responsibility whatsoever and expressly disclaims any responsibility for or in respect of any use of or reliance upon this report by any third party or parties.

It is the responsibility of the Client to accept if the Client so chooses any recommendations contained within and implement them in an appropriate, suitable and timely manner.

Appendices

Appendix A: Flora Species List

Scientific name	Common name	Native	Exotic
Angophora subvelutina	Broad-leaved Apple		
Araujia sericifera	Moth Vine		
Axonopus fissifolius	Narrow-leaf Carpet Grass		
Bidens Pilosa	Cobblers Peg		
Bothriochloa macra	Red Grass		
Bromus catharticus	Prairie Grass		
Centella asiatica	Gotu Kola		
Cheilanthes sieberi	Narrow Rock-fern		
Chloris virgata	Feathertop Rhodes Grass		
Commelina cyanea	Scurvy Weed		
Conyza bonariensis	Flaxleaf Fleabane		
Cymbopogon refractus	Barbed Wire Grass		
Cyperus brevifolius	Mullumbimby Couch		
Cyperus eragrostis	Umbrella Sedge		
Cyperus polystachyos	Bunchy Sedge		
Cyperus sesquiflorus			
Dichelachne micrantha	Shorthair Plumegrass		
Dichondra repens	Kidney Weed		
Digitaria didactyla	Queensland Blue Couch		
Echinopogon ovatus	Hedgehog Grass		
Entolasia stricta	Wiry Panic		
Eragrostis leptostachya	Paddock Lovegrass		
Eucalyptus eugenioides	Thin-leaved Strinkybark		
Eucalyptus tereticornis	Forest Red Gum		
Fimbristylis dichotoma	Common Fringe Sedge		
Geranium solanderi	Native Geranium		
Glycine microphylla	Small-leaf Glycine		
Glycine tabacina	Variable Glycine		
Gomphocarpus physocarpus	Balloon Cotton Bush		
Hypochoeris radicata	Catsear		

Scientific name	Common name	Native	Exotic
Hypoxis hygrometrica	Golden Weather-grass		
Juncus usitatus	Common Rush		
Lantana camara	Lantana		
Lomandra multiflora	Many-flowered Mat-rush		
Microlaena stipoides	Weeping Grass		
Monstera deliciosa	Swiss Cheese Plant		
Onopordum acanthium	Scotch Thistle		
Paspalum orbiculare	Ditch Millet		
Pennisetum clandestinum	Kikuyu		
Phytolacca octandra	Inkweed		
Plantago lancelota	Lambs Tounge		
Pratia purpurascens	Whiteroot		
Rubus fruticosus	Blackberry		
Rumex crispus	Curled Dock		
Senecio madagascariensis	Fireweed		
Setaria parviflora	Marsh Bristlegrass		
Sida rhomibiolia	Paddys's Lucerne		
Solanum linnaeanum	Apple of Sodom		
Sporobolus africanus	Parramatta Grass		
Streblus brunonianus	Whalebone Tree		
Taraxacum officinale	Dandelion		
Trifolium repens	White Clover		
Typha sp	Bulrush		
Verbena rigida	Veined Verbena		
Wahlenbergia gracilis	Australian Bluebell		

Appendix B: Fauna Species List

Class Name	Scientific Name	Common Name
Aves	*Bubulcus ibis*	Cattle Egret
	Cacatua galerita	Sulphur-crested Cockatoo
	Cracticus tibicen	Australian Magpie
	Chenonetta jubata	Australian Wood Duck
	Coracina novaehollandiae	Black-faced Cuckoo-shrike
	Corvus coronoides	Australian Raven
	Falco cenchroides	Nankeen Kestrel
	Grallina cyanoleuca	Magpie Lark
	Hirundo neoxena	Welcome Swallow
	Manorina melanocephala	Noisy Miner
	Platycercus eximius	Eastern Rosella
	Rhipidura leucophrys	Willie Wagtail
Amphibian	*Litoria Fallax*	Dwarf Green Tree Frog
Mammals	*Vulpes vulpes*	Fox

Appendix C: Threatened Flora Species (within surrounding 10km)

Scientific name	Common name	BC	EPBC
Acacia bynoeana	Bynoes Wattle	E	V
Allocasuarina glareicola		E	E
Arthropteris palisotii	Lesser Creeping Fern	E	-
Boronia deanei	Deanes Boronia	V	V
Caladenia tessellata	Thick-lipped Spider-orchid	E	V
Calochilus pulchellus	Pretty Beard Orchid	E	-
Chorizema parviflorum	Eastern Flame Pea	E	-
Cryptostylis hunteriana	Leafless Tongue Orchid	V	V
Cynanchum elegans	White-flowered Wax Plant	E	E
Daphnandra johnsonii	Illawarra Socketwood	E	E
Genoplesium baueri	Yellow Gnat Orchid	E	E
Gossia acmenoides	Scrub Ironwood	E	-
Grevillea raybrownii	-	V	-
Grevillea rivularis	Carrington Falls Grevillea	CE	E
Haloragis exaclata subsp.exalata	Wingless Raspwort	V	V
Irenepharsus trypherus	Illawarra Irene	E	E
Lespedeza juncea subsp. sericea	-	E	-
Macadamia integrifolia	Macadamia nut	-	V
Melaleuca biconvexa	Biconvex Paperbark	V	V
Persicaria elatior	Tall Knotweed	V	V
Persoonia hirsuta	Hairy Geebung	E	E
Persoonia oxycoccoides		E	-
Pimelea curviflora var.curviflora		V	V
Pimelea spicata	Spiked Rice-flower	E	E
Pomaderris brunnea	Rufous Pomaderris	E	V
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E
Pomaderris walshii	Carrington Falls Pomaderris	CE	CE
Prasophyllum affine	Jervis Bay Leek Orchid	E	E
Prostanthera densa	Villous Mintbush	V	V
Pterostylis gibbosa	Illawarra Greenhood	E	E
Pterostylis pulchella	Pretty Greenhood	V	V
Pterostylis saxicola	Sydney Plains Greenhood	E	E
Pultenaea aristata	Prickly Bush-pea	V	V

Rhizanthella slateri	Eastern Underground Orchid	-	E
Rhodamnia rubescens	Scrub Turpentine	CE	CE
Rhodomyrtus psidioides	Native Guava	CE	CE
Solanum celatum	-	E	-
Syzygium paniculatum	Magenta Lilly Pilly	E	V
Thelymitra kangaloonica	Kangaloon Sun Orchid	CE	CE
Thesium australe	Austral Toadflax	V	V
Xerochrysum palustre	Swamp Everlasting	-	V
Zieria granulata	Illawarra Zieria	E	E

Appendix D: Threatened Fauna Species (within surrounding 10km)

Scientific name	Common name	BC Act	EPBC Act
Birds			
Actitis hypoleucos	Common Sandpiper	-	M
Anthochaera phrygia	Regent Honeyeater	CE	CE
Aphelocephala leucopsis	Southern Whiteface	-	V
Apus pacificus	Fork-tailed Swift	P	M
Ardenna pacifia	Wedge-tailed Swift	P	M
Ardenna tenuirostris	Short-tailed Shearwater	P	M
Arenaria interpres	Ruddy Turnstone	-	M
Artamus cyanopterus cyanopterus	Dusky Woodswallow	V	-
Asyornis brachypterus	Eastern Bristlebird	E	E
Botaurus poiciloptilus	Australasian Bittern	E	E
Calidris acuminata	Sharp-tailed Sandpiper	-	M
Calidris alba	Sanderling	V	-
Calidris canutus	Red Knot	-	E
Calidris ferruginea	Curlew Sandpiper	E	CE
Calidris melanotos	Pectoral Sandpiper	-	M
Calidris ruficollis	Red-necked Stint	-	M
Calidris teuirostris	Great Knot	-	CE
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E
Calyptorhynchus lathami lathami	Southern-eastern Glossy Black-Cockatoo	-	V
Charadrius bicinctus	Double-banded Plover	-	M
Charadrius leschenaultiI	Greater Sand Plover	-	V
Charadrius mongolus	Lesser Sand Plover	-	E
Chlidonias leucopterus	White-winged Black Tern	-	M
Climacteris picumnus victoriae	Brown Treecreeper	V	-
Cuculus optatus	Oriental Cuckoo	-	M
Daphoenositta chrysoptera	Varied Stella	V	-
Dasyornis brachypterus	Eastern Bristlebird	E	-
Diomedea antipodensis	Antipodean albatross	-	V
Diomedea antipodensis gibsoni	Gibsons Albatross	V	V
Diomeda exulans	Wandering Albatross	E	E
Diomedea sanfordi	Northern Royal Albatross	-	E
Ephippiorhynchus asiaticus	Black-necked Stork	-	E

Epthianura albifrons	White-fronted Chat	V	-
Falco hypoleucos	Grey Falcon	V	V
Fregetta grallaria grallaria	White bellied Storm-Petrel	V	V
Gallinago hardwickii	Latham' s Snipe	-	M
Gallinago megala	Swinhoe' s Snipe	-	M
Gallinago strenura	Pin-tailed Snipe	-	M
Gelochelidon nilotica	Gull-billed Tern	-	M
Grantiella picta	Painted Honeyeater	V	V
Haematopus longirostris	Pied Oyster Catcher	E	-
Haliaeetus leucogaster	White-bellied Sea-Eagle	V	-
Hieraaetus morphnoides	Little Eagle	V	-
Hirundapus caudacutus	White-throated Needletail	-	V
Hydroprogne caspia	Caspian Tern	P	-
Lathamus discolor	Swift Parrot	E	CE
Limosa lapponica beaueri	Nunivak Bar-tailed Godwit	-	V
Limosa lapponica	Bar-tailed Godwit	-	M
Limosa limosa	Black-tailed Godwit	-	M
Lophoictinia isura	Square-tailed Kite	V	-
Macronectes giganteus	Southern Giant Petrel	E	E
Macronectes halli	Northern Giant Petrel	V	V
Melanodryas cucullate cucullate	South-eastern Hooded Robin	V	-
Monarcha melanopsis	Black-faced Monarch	-	M
Motacilla flava	Yellow Wagtail	-	M
Myiagra cyanoleuca	Satin Fly Catcher	-	M
Neophema chrysogaster	Orange-bellied Parrot	CE	CE
Neophema pulchella	Turquoise Parrot	V	-
Neopheme chrysostoma	Blue-winged Parrot	-	V
Ninox connivens	Barking Owl	V	-
Ninox strenua	Powerful Owl	V	-
Numenius madagascariensis	Eastern Curlew	-	CE
Numenius minutus	Little Curlew	-	M
Numenius phaeopus	Whimbrel	-	M
Oxyura australis	Blue-billed Duck	V	-
Pachycephala olivacea	Olive Whistler	V	-
Pachyptila turtur subantarctica	Fairy Prion	-	V
Pandion cristatus	Eastern Osprey	V	-
Pandion haliaetus	Osprey	-	M
Petroica boodang	Scarlet Robin	V	-

Petroica phoenicea	Flame Robin	V	-
Petroica rodinogaster	Pink Robin	V	-
Phoebetria fusca	Sooty Albatross	-	V
Pluvialis fulva	Pacific Golden Plover	-	M
Pluvialis squatarola	Grey Plover	P	-
Pterodroma leucoptera leucoptera	Gould Petrel	V	E
Pterodroma neglecta neglecta	Kermadec Petrel	V	V
Pycnoptilus floccosus	Pilotbird	-	V
Rhipidura rufifrons	Rufous Fantail	-	M
Rostratula australis	Australian Painted Snipe	E	E
Stagonopleura guttata	Diamond Firetail	V	-
Sterna hirundo	Common tern	P	-
Sternula albifrons	Litter Tern	E	-
Sternula nereis nereis	Fairy Tern	-	V
Stictonetta naevosa	Freckled Duck	V	-
Symposiachrus trivirgatus	Spectacled Monarch	-	M
Thalassarche bulleri	Buller' s Albatross	-	V
Thalassarche bulleri platei	Northern Bullers Albatross	-	V
Thalassarche carteri	Indian Yellow-nosed Albatross	-	V
Thalassarche cauta	Shy Albatross	E	E
Thalassarche eremita	Chatham Albatross	-	E, M
Thalassarche melanophris	Black-browed Albatross	V	V
Thalassarche salvini	Salvins Albatross	-	V
Thalassarche steadi	White-capped Albatross	-	V
Thalasseus bergii	Crested Tern	P	M
Tringa brevipes	Grey-Tailed Tattler	-	M
Tringa incana	Wandering Tattler	P	M
Tringa nebularia	Common Greenshank	P	M
Tringa stagnatilis	Marsh Sandpiper	-	M
Tyto novaehollandiae	Masked Owl	V	-
Tyto tenebricosa	Sooty Owl	V	-
Xenus cinereus	Terek Sandpiper	V	-
Mammals			
Chalinolobus dwyeri	Large-eared Pied Bat	V	V
Cercartetus nanus	Eastern Pygmy-possum	V	-
Dasyurus maculatus maculatus	Spotted-tailed Quoll	V	E
Falsistrellus tasmaniensis	Eastern False Pipistrelle	V	-
Isoodon obesulus obesulus	Southern Brown Bandicoot	E	E

Miniopterus australis	Little Bent-winged Bat	V	-
Myotis Macropus	Southern Myotis	V	-
Notamacropus parma	Parma Wallaby	V	V
Petauroides volans	Greater Glider	-	V
Petaurus australis australis	Yellow-bellied Glider	V	V
Petrogale penicillata	Brush-tailed Rock-wallaby	E	V
Phascolarctos cinereus	Koala	E	E
Potorous tridactylus trisulcatus	Long-nosed Potoroo	-	V
Pseudomys novaehollandiae	New Holland Mouse	-	V
Pteropus poliocephalus	Grey-headed Flying-fox	V	V
Saccolaimus flaviventris	Yellow-bellied Sheathtail-bat	V	-
Scoteanax rueppellii	Greater Broad-nosed Bat	V	-
Reptiles			
Heleioporus australiacus	Giant Burrowing Frog	V	V
Hoplocephalus bungaroides	Broad-headed Snake	E	V
Litoria aurea	Green and Golden Bell Frog	E	V
Litoria littlejohni	Littlejohn' s Tree Frog	V	E
Litoria watsoni	Watson' s Tree Frog	-	E
Mixophyes balbus	Stuttering Frog	E	V
Pseudophryne australis	Red-crowned Toadlet	V	-