ecoplanning

ecology | planning | offsets

Flora and Fauna Assessment

Lot 3 // DP 706194 and Lot 12 // DP 866036, Yarrawa Rd and Lovelle St, Moss Vale, NSW

Proposed Residential Subdivision

Prepared for Prime Moss Vale Pty Ltd

8 October 2018

PROJECT NUMBER	2018-112		
PROJECT NAME	Flora and Fauna Assessment		
PROJECT ADDRESS	Lot 3 // DP 706194 and Lot 12 // DP 866036, 141 Yarrawa Rd and 32 Lovelle St, Moss Vale, NSW, 2577		
PREPARED FOR	Prime Moss Vale Pty Ltd		
AUTHOR/S	Angela Bibby		
REVIEW	Brian Towle		
VERSION	**Version**	**Draft/Final**	**Date to client**
	1.0	Draft	13/09/2018
		Final	8/10/2018

This report should be cited as: *Ecoplanning (2018). Flora and Fauna Assessment Lot 3 // DP 706194 and Lot 12 // DP 866036, Yarrawa Rd and Lovelle St, Moss Vale, NSW. Prepared for Prime Moss Vale Pty Ltd.*

ECOPLANNING PTY LTD
74 HUTTON AVENUE BULLI NSW 2516
M: 0421 603 549
www.ecoplanning.com.au

Glossary and abbreviations

Abbreviation	Description
BC Act	NSW *Biodiversity Conservation Act 2016*
DoE	Commonwealth Department of the Environment
CEEC	Critically Endangered Ecological Community
EEC	Endangered Ecological Community
EP&A Act	NSW *Environmental Planning and Assessment Act 1979*
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
LEP	Local Environmental Plan
LGA	Local Government Area
Mm/cm/m/km	Millimetres/centimetres/metres/kilometres
masl	Metres above sea level
MNES	Matters of National Environmental Significance
SHSW	Southern Highlands Shale Woodlands
TEC	Threatened Ecological Community, listed as vulnerable, endangered or critically endangered under either the BC Act and/or EPBC Act
WLEP	Wingecarribee Local Environmental Plan
*	Denotes exotic species

Contents

Figures

Tables

Executive summary

Ecoplanning was commissioned to undertake a flora and fauna assessment for a proposed development of Lot 3 // DP 706194 and Lot 12 // DP 866036, 141 Yarrawa Rd and 32 Lovelle St, Moss Vale, NSW (the study area). Under the Wingecarribee LEP (2010) the study area is predominantly zoned R2 (Low Density Residential). Sections in the north-east of the study area are zoned R5 (Large Lot Residential) and a small portion in the centre and along the south-west boundary is zoned RE1 (Public Recreation). At the time of writing this report a final development footprint had not been prepared, therefore for the purposes of impact assessment it has been assumed that all vegetation within the study area will be removed. The proposal is to be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

Field assessment of the study area aimed to validate regional vegetation mapping conducted by Tozer et al. (2010) and confirmed the presence of two isolated *Eucalyptus radiata* (Narrow-leaved Peppermint) trees which are considered remnants of Southern Highlands Shale Woodlands in 'scattered paddock tree' condition. In addition, field assessment identified the remaining vegetation in the study area to predominantly consist of 'Exotic Pasture' with some small patches of 'Plantings' and 'Weeds and Exotics'. Numerous 'Artificial Wetlands' were also identified within the study area along with some areas of 'Existing Infrastructure'.

Southern Highlands Shale Forest and Woodland of the Sydney Basin Bioregion, which encompasses the Southern Highlands Shale Woodlands is listed as a Critically Endangered Ecological Community (CEEC) under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Consideration of the condition thresholds in the Conservation Advice (TSSC 2015) resulted in the conclusion that the Southern Highlands Shale Forest and Woodland is not a MNES. Therefore, assessment according to the Significant Impact Criteria (DoE 2013) was not required and has not been undertaken.

Southern Highlands Shale Woodlands in the Sydney Basin Bioregion is listed as an EEC under the NSW *Biodiversity Conservation Act 2016* (BC Act). Assessment in accordance with Section 7.3 of the BC Act determined that the proposed removal of approximately 0.03 ha of Southern Highlands Shale Woodlands (represented by two isolated *Eucalyptus radiata*) is not likely to have a significant effect on this EEC. However, it is recommended that these two trees be retained if possible.

No threatened flora species listed under the EPBC Act or BC Act were recorded in or are likely to occur within the study area. Several threatened microbat species have only low potential to utilise the subject site for foraging and roosting habitat, and the proposal requires the removal of only a small area of native vegetation (~0.03 ha of Southern Highlands Shale Woodlands in 'scattered paddock tree' condition).

The study area includes waterfront land as defined under the NSW *Water Management Act 2000* (WM Act) and riparian land under the Wingecarribee LEP (2010). Where the final development footprint involves impacts to waterfront land a controlled activity approval will be necessary in accordance with the WM Act. It is recommended that restoration of aquatic and

riparian vegetation and habitat be achieved through the preparation and implementation of a Vegetation Management Plan to meet the requirements of clause 7.5 of the WLEP.

Potential indirect impacts associated with the proposal have been adequately mitigated through appropriate avoidance and mitigation measures (see **Section 4.3**).

1 Introduction

1.1 Purpose of report and legislative context

Ecoplanning was commissioned to undertake a flora and fauna assessment for a proposed subdivision of Lot 3 // DP 706194 and Lot 12 // DP 866036, Yarrawa Rd and Lovelle St, Moss Vale, NSW. The proposal is to be assessed under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The purpose of this report is to identify and assess the flora and fauna within the study area and the likely impacts of the proposed development. This report addresses the legislative context provided in (**Table 1.1**).

Table 1.1: Legislative framework reviewed in this report.

Instrument	Considerations	Context
Commonwealth		
Environment Protection and Biodiversity Conservation Act (EPBC Act) 1999	Matters of National Environmental Significance	An action will require approval from the Minister if the action has, will have, or is likely to have, a significant impact on a matter of national environmental significance.
State (New South Wales)		
Biodiversity Conservation Act (BC Act) 2016	Part 4, Divisions 2 and 5	Lists threatened species, ecological communities and key threatening processes to be considered under s7.3
	Section 7.3	Test for determining whether proposed development or activity is likely to significantly affect threatened species or ecological communities, or their habitats
Biodiversity Conservation Regulation (BC Reg) 2017	Section 7.1, 7.2 and 7.3	Thresholds for entry into the Biodiversity Offset Scheme established under the BC Act.
Local Government		
Wingecarribee Local Environmental Plan (WLEP) 2010	Clause 7.4 – Natural Resource Sensitivity - Biodiversity	The objective of this clause is to maintain terrestrial and aquatic biodiversity, including: (a) protecting native fauna and flora, and (b) protecting the ecological processes necessary for their continued existence, and (c) encouraging the recovery of native fauna and flora, and their habitats. This clause applies to land identified as "Regional Wildlife Habitat Corridor" on the 'Natural Resources Sensitivity Map'.

Instrument	Considerations	Context
	Clause 7.5 – Natural Resource Sensitivity - Water	The objective of this clause is to maintain the hydrological functions of riparian land waterways and aquifers, including: (a) protecting water quality, and (b) protecting natural water flows, and (c) protecting stability of the bed and banks of waterways, and (d) protecting groundwater systems. This clause applies to riparian land or land identified as “Natural Waterbodies” on the ‘Natural Resources Sensitivity Map’.

1.2 Site description

1.2.1 Subject site and study area

Following the *Threatened Species Test of Significance Guidelines* (OEH 2018) the ***subject site*** is defined as the area 'directly affected by the proposal', and includes all vegetation proposed to be removed. The ***study area*** is defined as the subject site and all areas that are directly or indirectly affected by the proposal.

The study area is identified as Lot 3 // DP 706194 and Lot 12 // DP 866036 (**Figure 1.1**) and is situated in the Wingecarribee Local Government Area (LGA) on predominantly sedimentary soil, (with low quartz) (**Figure 1.2**). Under the WLEP (2010), the majority of the study area is zoned R2 (Low Density Residential), with sections in the north-east of the study area zoned R5 (Large Lot Residential) and a small portion in the centre and along the south-west boundary zoned RE1 (Public Recreation) (**Figure 1.3**).

The study area comprises approximately 124.30 ha of mostly cleared land with small scattered patches of exotic vegetation. Tozer et al. (2010) mapped small patches of Southern Highlands Shale Woodland along the boundary and within the adjoining golf course property to the north and north-west of the study area (**Figure 1.4**) and a small patch of Tableland Basalt Forest also in the golf course property to the north-west of the study area. Several first order tributaries of Whites Creek run through the north of the study area (**Figure 1.5)**. A first order tributary of the Wingecarribee River also runs from the east of the study area to the north-east.

1.2.2 Locality

Unless otherwise stated, the ***locality*** is described as the area within 5 km of the study area (**Figure 1.6**). The locality includes land that is zoned E3 – Environmental Management (5870 ha, ~55%), RU2 – Rural Landscape (2242 ha, ~21%), R2 – Low Density Residential (538 ha, ~5%), IN1 – General Industrial (580 ha, ~5%) and SP3 – Tourist (365 ha, ~3%) under the LEP (WLEP 2010). A large portion of the locality consists of cleared lands, having historically been cleared for agriculture. Within the locality, native vegetation primarily occurs along the fringes of Meryla State Forest with isolated patches throughout the remainder of the locality. The central urban area of Moss Vale is situated approximately 1 km to the north of the study area.

1.3 Description of the proposal

The study area consists of Lot 3 // DP 706194 and Lot 12 // DP 866036 and is 124.73 ha in size. At the time of this report a final development footprint had not been prepared, therefore for the purposes of impact assessment it has been assumed that all vegetation within the study area will be removed.

Figure 1.1: Study area.

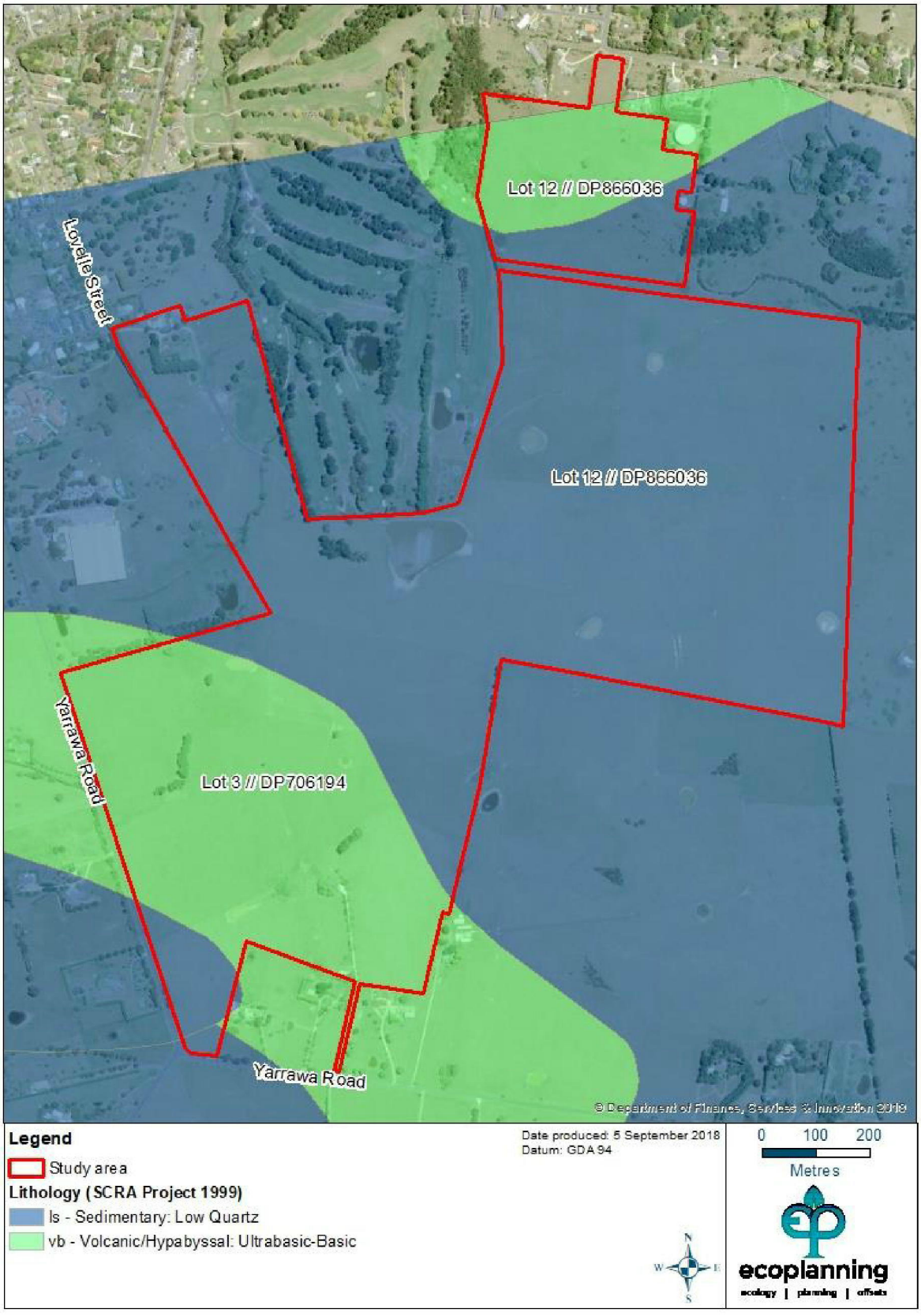

Figure 1.2: Lithology in the study area.

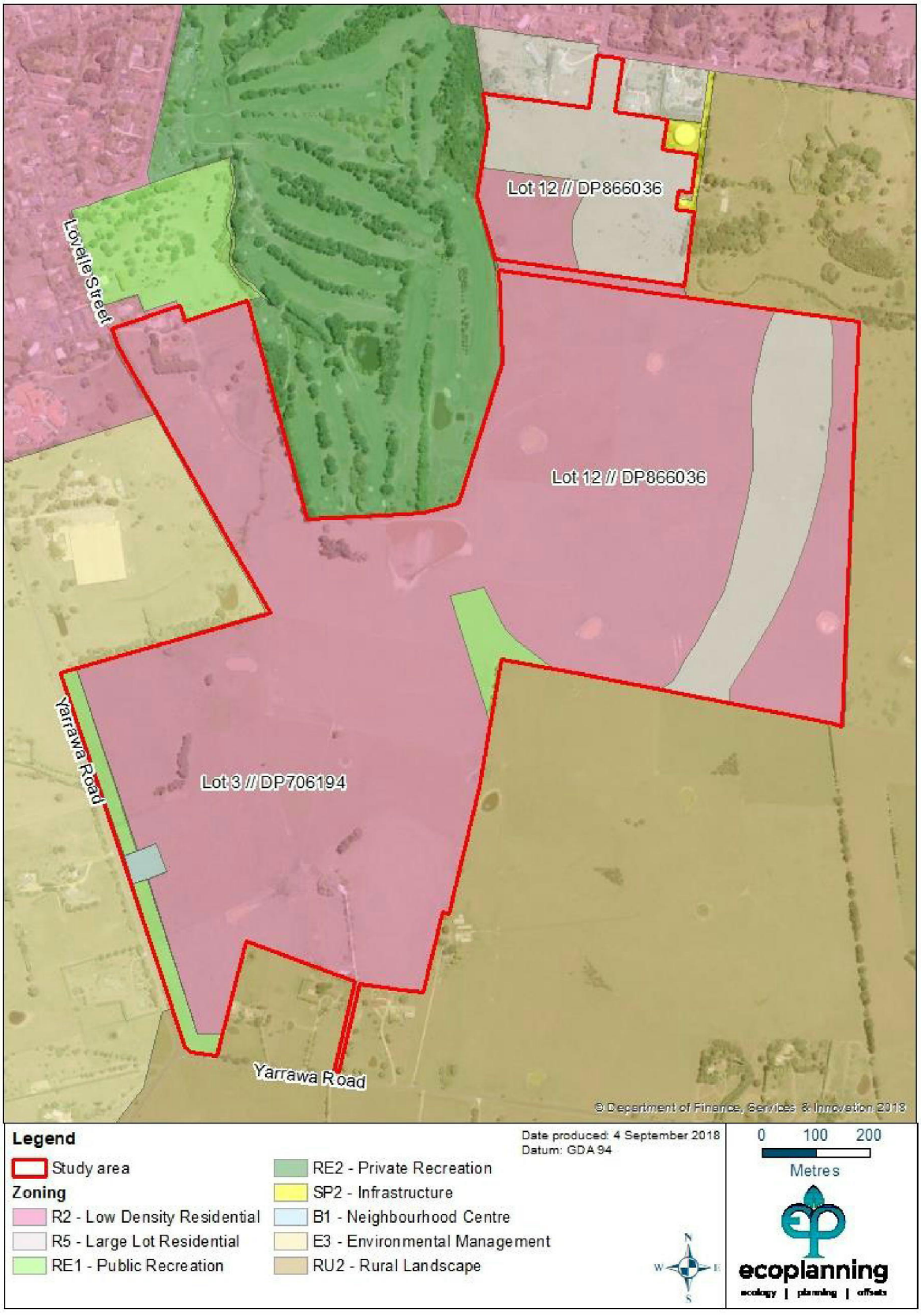

Figure 1.3: Landuse zoning.

Figure 1.4: Vegetation mapped by Tozer et al. (2010).

Figure 1.5: Strahler stream order with associated riparian buffer of the watercourses in the study area.

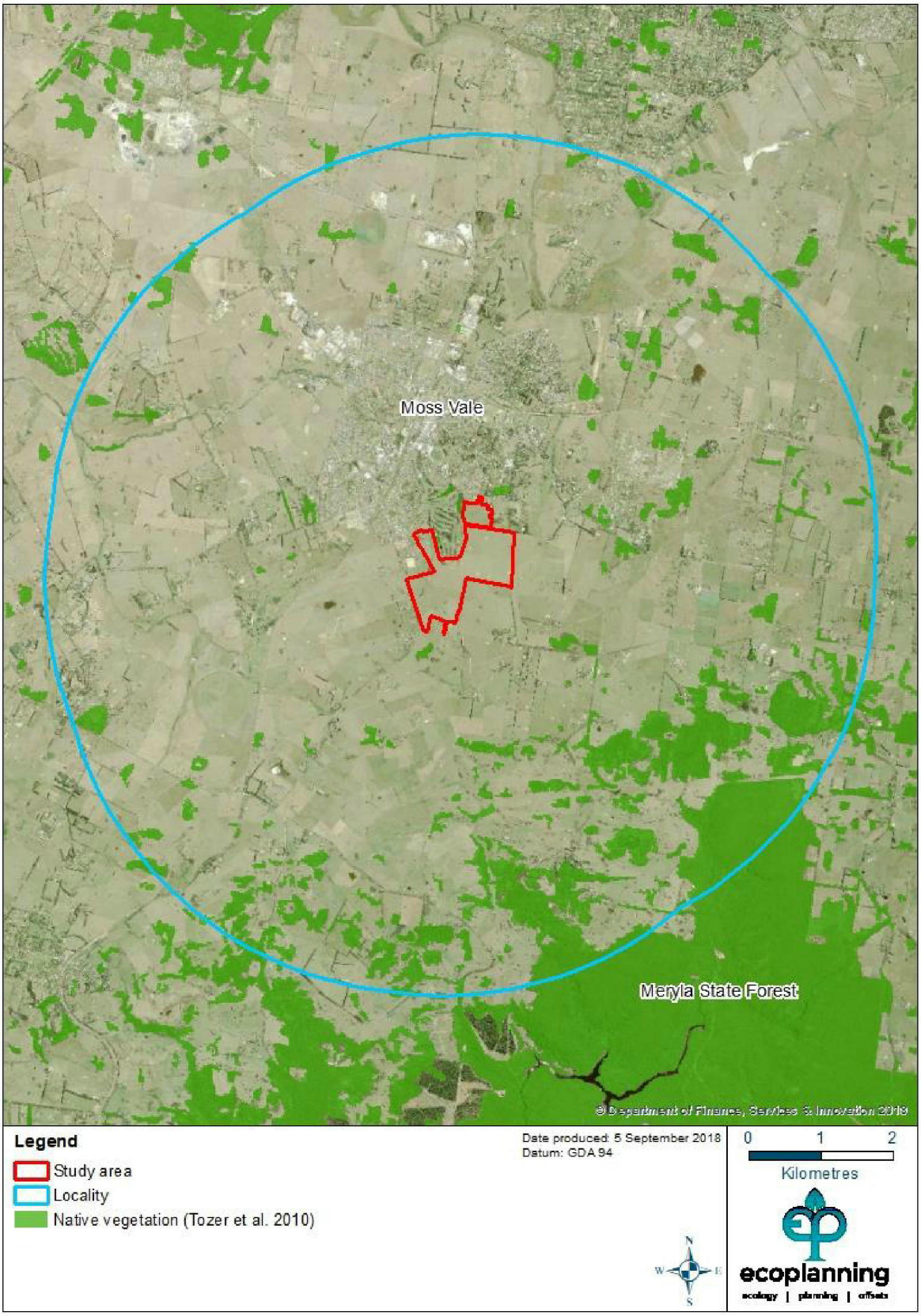

Figure 1.6: Areas of native vegetation within 5km of the study area (Tozer et al. 2010).

2 Methods

2.1 Literature and database review

A site-specific literature and database review was undertaken prior to the field survey and the preparation of this report. This included desktop analysis of aerial photography and review of regional scale information from the following sources:

- NSW Planning Viewer (NSW Dept. of Planning and Environment 2018)
- BioNet Atlas of NSW Wildlife (NSW Office of Environment and Heritage 2018)
- Protected Matters Search Tool (Commonwealth Department of the Environment and Energy (DoE) 2018a)
- SIX Maps (LPI 2018)
- Native Vegetation of South East NSW (Tozer et al. 2010)

The following policies and guidelines were considered in the preparation of this report:

- Threatened Species Test of Significance Guidelines (OEH 2018).

Threatened species, populations and migratory species that were recorded within 5 km of the study area in the Atlas of NSW Wildlife (OEH 2018) and listed in the EPBC Protected Matters Search Tool were consolidated and their likelihood of occurrence was assessed by:

- reviewing the location and date of recent (<5 years) and historical (>5-20 years) records
- reviewing available habitat within the study and surrounding areas
- reviewing the scientific literature pertaining to each species and population
- applying expert knowledge of each species

The potential for each threatened species, population and/or migratory species to occur was then considered and the necessity for targeted field surveys was determined. Following field surveys and review of available habitat within the study area, the potential for species or populations to use the study area and to be affected directly or indirectly by the proposal were identified as either:

- “Recent record” = species has been recorded in the study area within the past 5 years
- “High” = species has previously been recorded in the study area (>5 years ago) or in proximity to (for mobile species), and/or habitat is present that is likely to be used by a local population
- “Moderate” = suitable habitat for a species is present onsite but no evidence of a species detected and relatively *high* number of recent records (5-20 years) in the locality or species is highly mobile
- “Low” = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively *low* number of recent records in the locality
- “Not present” – suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

2.2 Field survey

A field survey was undertaken on 23 August 2018 by Elizabeth Norris (Senior Ecologist/Botanist) over a total of 5 person hours. Weather conditions on the day were cool and overcast with light winds, no rain was recorded 24 hours prior to the survey (**Table 2.1**).

Table 2.1: Daily weather observation at Moss Vale AWS station 068239 (4 km north-east of the study area).

Date	Temp (°C)		Rainfall (mm)	Max wind	
	Min	Max		Direction	Speed (km/h)
23/08/2018	-3.4	10.4	0	NE	24

2.2.1 Vegetation communities and flora

Field survey involved traversing the study area whilst recording native and exotic flora species, with a focus on identifying potential habitat for threatened flora species. Areas of the study area containing native vegetation were surveyed more extensively than cleared areas of the site. Nomenclature follows the Flora of NSW (Harden 1990-2002) and updates provided in PlantNET (RBGDT 2017).

Field survey was undertaken to check the regional vegetation mapping of Tozer et al. (2010) and to describe the vegetation on the site based on site-specific information. Vegetation communities were also checked against described Threatened Ecological Communities (TECs) listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the *Biodiversity Conservation Act 2016* (BC Act).

2.2.2 Fauna and fauna habitat

Opportunistic fauna survey was undertaken for birds, amphibians, reptiles and mammals, which included opportunistic observations of fauna along with observations of signs of direct and indirect occupancy (i.e. scats, owl pellets, fur, bones, tracks, bark scratches, foliage chew marks and chewed cones of *Allocasuarina* spp. or *Pinus* spp. as well as some of the other cultivars known to be used by fauna).

Fauna habitat searches were conducted for potential foraging, roosting, breeding or nesting habitats of nocturnal and diurnal species. This included inspections to determine the presence of any tree hollows, stags, bird nests, possum dreys, decorticating bark, rock shelters, rock outcrops / crevices, mature / old growth trees, food trees (*Banksia* spp., *Allocasuarina* spp., and winter-flowering eucalypts), culverts, dens, dams, riparian areas and refuge habitats of man-made structures.

Primary sources of literature accessed for species nomenclature include:

- Birds - Christidis and Boles (2008)
- Mammals - Van Dyck and Strahan (2008)
- Reptiles and amphibians - Cogger (2014)
- Terrestrial invertebrates - Australian Faunal Directory (ABRS 2009)

2.2.3 Survey limitations

The flora survey aimed to record as many species as possible. However, a definitive list of the flora within the study area cannot be gathered without systematic traverses and survey across a number of seasons. Given the vegetation on the site and the site history, this level of survey

effort was not deemed necessary for this assessment. While additional species would be recorded during a longer survey over various seasons, the techniques used in this investigation are considered to be adequate to gather the data necessary to validate the vegetation communities and vegetation condition in the study area, and to detect any threatened flora that had potential to occur.

A full fauna survey following *Threatened Species Survey and Assessment Guidelines* (OEH 2013) was not undertaken as sufficient detail to determine the likelihood of occurrence of threatened and migratory species for the purpose of this report was achieved through habitat assessment during the field survey.

3 Results

3.1 Literature and database review

3.1.1 Topography, geology and drainage

The study area is situated approximately 700 masl on sedimentary and volcanic/hypabyssal rock types (**Figure 1.2**). The study area is generally flat. First order tributaries of Whites Creek run through the study area, generally east to west, south to north. A first order tributary of Wingecarribee River runs from the east of the study area in a north-easterly direction (**Figure 1.5**).

3.1.2 Threatened species, populations and migratory species

A search of relevant databases and literature resulted in the identification of 15 threatened or migratory species that have been previously recorded within the locality (within 5 km of the study area), including one threatened flora species and 14 threatened fauna species (10 birds, one marsupial, two microbats and a megabat) (**Figure 3.1**).

Consideration of the likelihood of occurrence for each of these 15 species, undertaken prior to the field survey, reduced the primary list to one threatened species that has a 'moderate' potential to use the study area. Based on the site-specific information collected during the field survey it was determined that no threatened fauna or flora species would be likely to utilise the subject site (**Appendix A**).

3.1.3 Vegetation and threatened ecological communities

Tozer et al. (2010) had mapped one native vegetation community (Southern Highlands Shale Woodland) as occurring within the study area (**Figure 1.4**). Tableland Basalt Forest was also mapped as occurring in the adjacent property to the north-west corner of the study area.

Southern Highlands Shale Woodlands in the Sydney Basin Bioregion is recognised an endangered ecological community (EEC) under the BC Act (OEH 2018) and a critically endangered community (CEC) under the EPBC Act (DoE 2018b).

Tableland Basalt Forest is listed as an EEC under the BC Act and is known to grade into Upland Basalt Eucalypt Forests of the Sydney Basin Bioregion (a threatened ecological community (TEC) under the EPBC Act).

3.1.4 Natural Resource Sensitivity - Biodiversity

The study area does not occur on land identified as 'Regional Wildlife Habitat Corridor' on the Natural Resources Sensitivity Map (WLEP 2010).

3.1.5 Natural Resource Sensitivity – Water

The study area contains land mapped as riparian land and described as a 'Category 3 Watercourse' on the Natural Resources Sensitivity Map (WLEP 2010) (**Figure 3.2**).

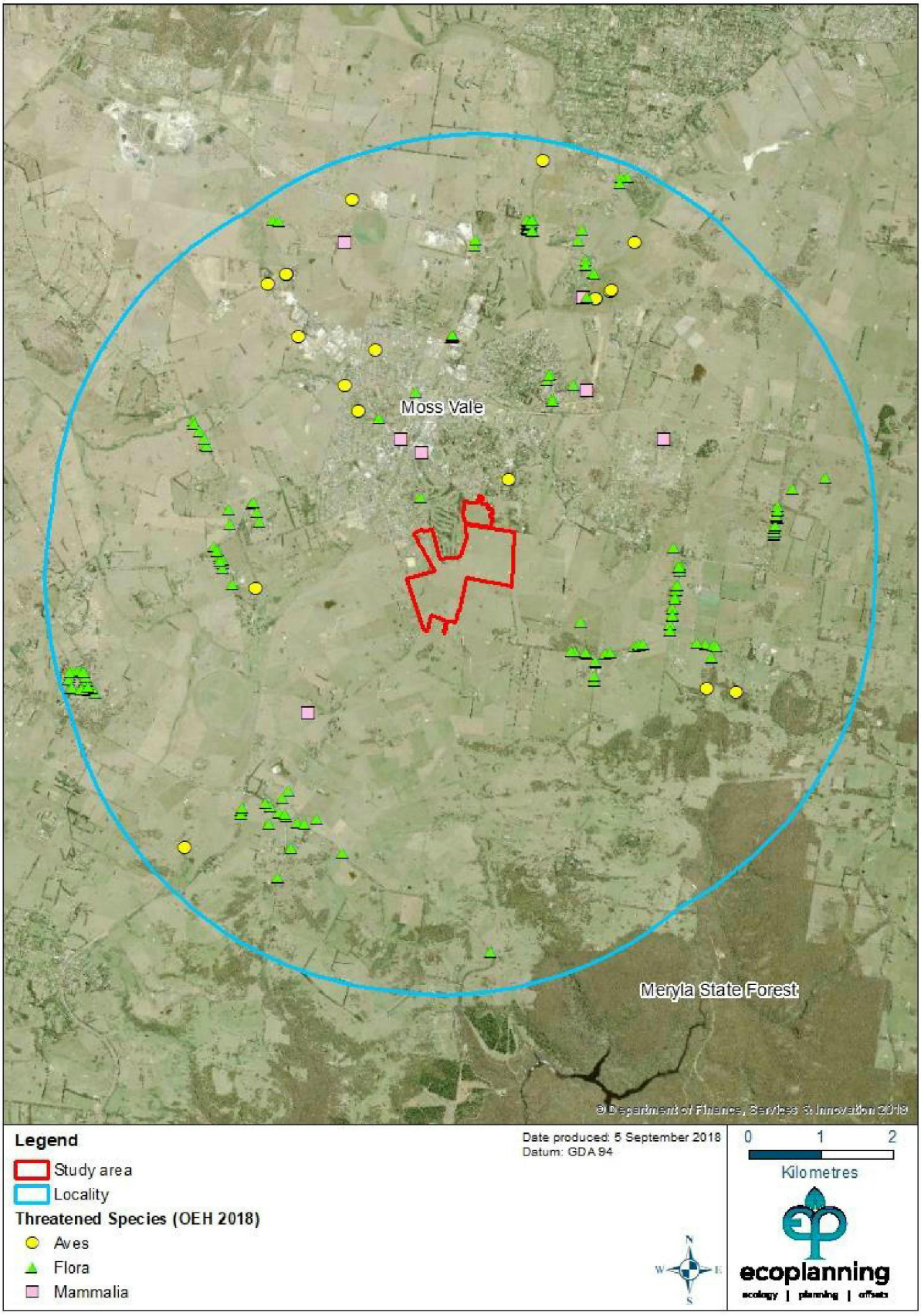

Figure 3.1: Threatened species records (OEH 2018).

Figure 3.2: Riparian land (WLEP 2010).

3.2 Field survey

3.2.1 Vegetation communities and flora species

The only native vegetation mapped during the field survey was two isolated *Eucalyptus radiata* (Narrow-leaved Peppermint) trees which represent remnants of Southern Highlands Shale Woodland in a 'scattered paddock tree' condition class (**Figure 3.3**). The majority of the study area was determined to be 'Exotic Pasture', dominated by exotic grasses and herbs such *Cenchrus clandestinus* (Kikuyu), *Lolium* sp.* (Rye Grass), and *Cirsium vulgare* (Spear Thistle). Smaller patches of exotic 'Plantings' and 'Weeds and Exotics' were present throughout the study area, along with numerous dams mapped as 'Artificial wetlands'.

Southern Highlands Shale Woodland

Two single *E. radiata* were found within the study area. One along the northern border (in the relative centre of the site) adjacent to the golf course and another along the north-eastern boundary of the study area (**Figure 3.4**). These trees represent remnants of Southern Highlands Shale Woodland, now in a 'scattered paddock tree' (SPT) condition class. There were no midstorey species present. The groundlayer was a mix of exotic pasture grasses such as *C. clandestinus** and *Lolium* sp.*, and the cosmopolitan grass species *Cynodon dactylon* (Couch).

Other vegetation – Exotic Pasture

This map unit includes all areas of the site with a high abundance and cover of exotic grasses, including: *C. clandestinus**, *Lolium* sp.*, *Axonopus fissifolius** (Narrow-leaved Carpet Grass), *Bromus catharticus** (Prairie Grass) and *Nassella trichotoma* (Serrated Tussock). Many exotic herbs such as *Cirsium vulgare**, *Modiola caroliniana** (Red-flowered Mallow), *Taraxacum officinale** (Dandelion) and *Plantago lanceolata** (Lamb's Tongues) and some native grasses such as *Rytidosperma* sp.* (Wallaby Grass) are also present within this vegetation zone (**Figure 3.5**). Exotic pasture comprises 119.6 ha or 96 % of the study area.

Artificial Wetlands

This map unit includes all dams and artificial waterbodies within the study area (**Figure 3.6**). There was no fringing vegetation or aquatic flora recorded during field assessment. Artificial wetlands comprise 2.39 ha or 2% of the study area.

Weeds and Exotics

This map units includes areas of woody weeds such as *Salix* sp.* (Willow) (**Figure 3.7**) and *Rubus fruticosus* (Blackberry) along the riparian corridor within the north-west of the study area and a small patch of problematic herbaceous weeds such as *Silybum marianum** (Variegated Thistle) (**Figure 3.8**), *Datura* sp.* (Thornapple), *Senecio madagascariensis** (Fireweed) and *Arctotheca calendula** (Capeweed) in the north-east of the study area.

Plantings

This map unit includes areas of exotic plantings dominated by *Pinus radiata** (Radiata Pine) and *P. pinaster* (Cluster Pine) (**Figure 3.9**). Some areas of plantings also contain *Cupressus* spp., *Ulex europaeus* (Furze) and *Malus* sp. (Apple).

Condition thresholds under the EPBC Act

The Conservation Advice for Southern Highlands Shale Forest and Woodland of the Sydney Basin Bioregion (TSSC, 2015) provides condition thresholds for when a patch of TEC retains

sufficient conservation value to be considered as a Matter of National Environmental Significance (MNES) (**Table 3.1**).

A review of the approved Conservation Advice (TSSC 2015) concluded that the mapped area of Southern Highlands Shale Woodland does not meet the condition thresholds to be categorised as a MNES since the patch size is too small (<0.5 ha) and does not contain sufficient native understorey cover. Therefore, the Southern Highlands Shale Woodland will not require assessment in accordance with the Significant Impact Guidelines Commonwealth Department of the Environment (DoE) (2013).

Table 3.1: Condition categories, rationale and thresholds for Southern Highlands Shale Forest Woodland (TSSC 2015).

Category and rationale	Patch size thresholds	Biotic thresholds		
A1. High condition class A larger patch with good quality native understorey.	≥2 ha	Patch size ≥ 2 ha **AND**		
		≥ 50% of the perennial understory vegetation cover* is made up of native species.	**OR**	≥ 30 native understory species per ha
A2. High condition class A patch with very good quality native understorey.	≥0.5 ha	Patch size ≥ 0.5 ha **AND** ≥ 70% of the perennial understorey vegetation cover is made up of native species		
B1. Moderate condition class A patch with good quality native understorey.	≥0.5 ha	Patch size ≥ 0.5 ha **AND**		
		≥ 50% of perennial understorey vegetation cover is made up of native species	**OR**	≥ 15 native understorey species per 0.5 ha
B2. Moderate condition class A moderate sized patch with connectivity to a native vegetation area; or a mature tree; or a tree with hollows.	≥0.5 ha	Patch size ≥ 0.5 ha **AND** ≥ 30% of the perennial understory vegetation cover is made up of natives **AND**		
		The patch is contiguous** with another type of native vegetation remnant (i.e. any native vegetation where cover in each layer present is dominated by native species) >1 ha in area	**OR**	The patch has at least one tree with hollows per 0.5 ha or at least one large locally indigenous tree (>60cm dbh) per 0.5 ha

Notes:

**Perennial understorey vegetation cover includes vascular plant species of the ground and shrub layers (where present) with a lifecycle of more than two growing seasons. The ground layer includes herbs (i.e. graminoids, forbs, and low shrubs [woody plants*

***Contiguous means the patch of the ecological community is continuous with, or in close proximity (within 100 m) to, another area of vegetation that is dominated by native species in each vegetation layer present.*

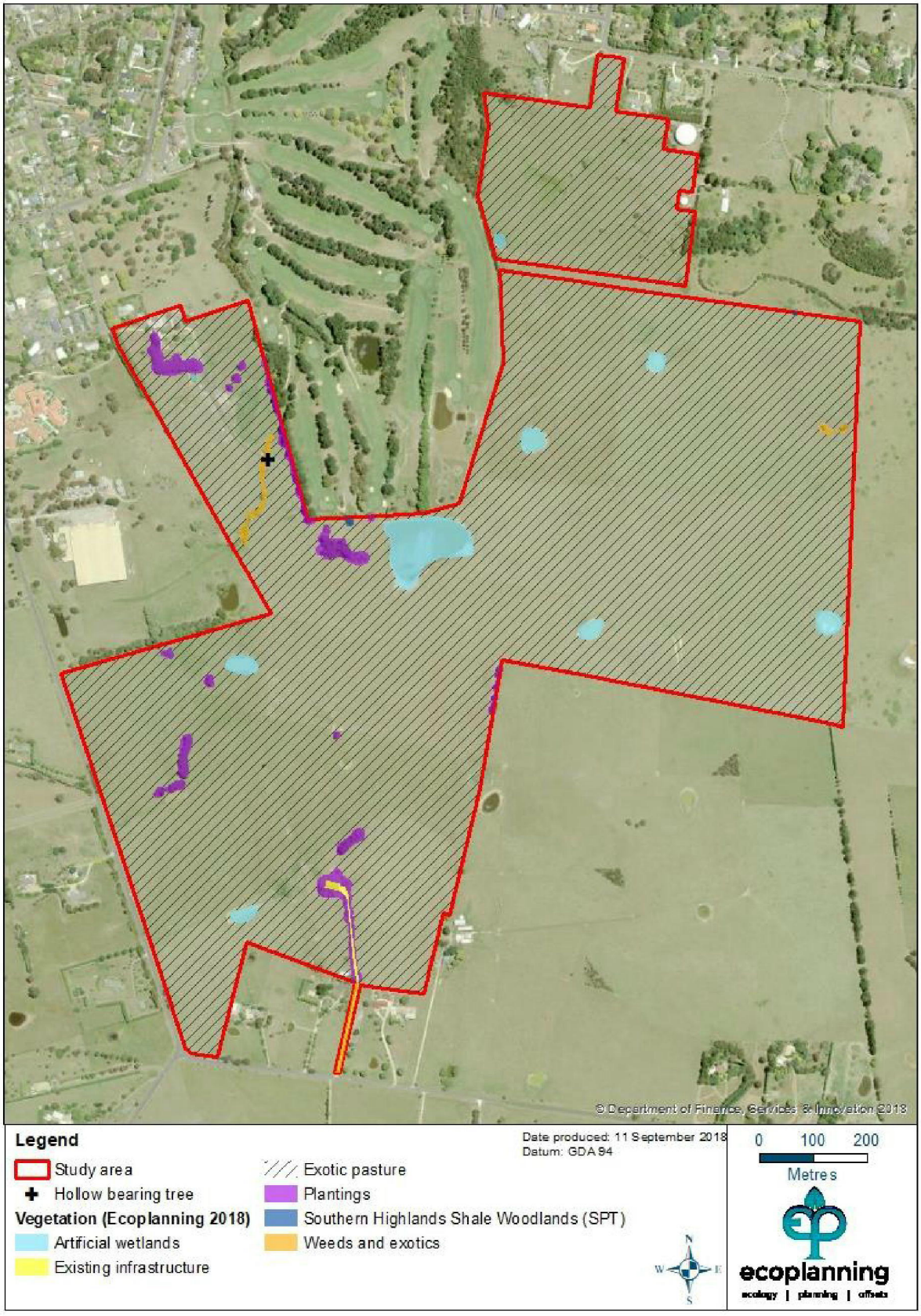

Figure 3.3: Field validated vegetation in the study area (Ecoplanning 2018).

Figure 3.4: Southern Highlands Shale Woodland (SPT), *Eucalyptus radiata* (Narrow-leaved Peppermint).

Figure 3.5: Exotic pasture (dominated by *Cenchrus clandestinus*).

Figure 3.6: Artificial wetlands with no aquatic flora in the north-west of the study area.

Figure 3.7: Weeds and Exotics with *Salix* sp. Present along the riparian corridor in the north-west of the study area.

Figure 3.8: Weeds and Exotics with *Silybum marianum* and *Cerastium glomeratum* in the north-east of the study area.

Figure 3.9: Plantings dominated by *Pinus radiata* and *P. pinaster.*

3.2.2 Flora species

A total of 48 flora species were identified within the study area, of which 34 are exotic and 14 are native (**Appendix B**). No individuals or populations of threatened flora species were recorded or are expected to occur in the study area.

3.2.3 Fauna habitat

Fauna habitat within the subject site is limited to potential foraging and roosting resources. The fauna habitat features present throughout the study area include:

- Woodland (Pine plantings)
- Grassland
- Artificial wetlands
- Woody debris and fallen timber
- Hollows within creek embankments (**Figure 3.10**)
- Hollow bearing tree (**Figure 3.11**)

A large proportion of the vegetation in the study area consists of Exotic pasture, which provides minimal foraging habitat. Field inspections identified one hollow bearing tree (HBT), however this was within an exotic species (*Salix* sp.*) and closer inspection confirmed that no fauna species were currently utilising the hollow. The habitat features relevant to each fauna group are shown in **Table 3.2**.

Table 3.2: Key fauna habitat features of relevance to fauna in the study area.

Habitat features	Fauna species
Woodland	Diurnal and nocturnal birds and arboreal mammals
Grassland	Microchiropteran bats and reptiles
Artificial Wetlands	Microchiropteran bats, amphibians, reptiles and waterbirds
Woody debris and fallen timber	Reptiles, birds and terrestrial mammals
Creek banks	Spotted pardalote
Hollow bearing tree	Microchiropteran bats, diurnal and nocturnal birds and arboreal mammals

3.2.4 Fauna species

The field survey undertaken for this report recorded a total of 24 fauna species. This is likely to be below the number of species that are likely to use the site and results should be considered with regard to the survey limitations outlined in **Section 2.2.3**.

Figure 3.10: Habitat for Spotted Pardalote.

Figure 3.11: Hollow bearing *Salix* sp.

4 Impact assessment

This section outlines the anticipated direct and indirect impacts of the development on the ecological values of the study area.

4.1 Direct impacts

4.1.1 Vegetation clearing

The final project footprint has not been determined and the exact areas of vegetation clearing are unknown. For the purposes of assessing potential impacts it has been assumed that all native vegetation would be cleared which includes ~0.03 ha of Southern Highlands Shale Woodland in a 'SPT' condition. Vegetation clearing would also impact on ~120 ha of Exotic Pasture, ~2.4 ha of Artificial Wetlands, ~2 ha of Plantings, 0.3 ha of Weeds and Exotics and ~0.2 ha of Existing Infrastructure. As such, 99.98% of all direct impacts within the study area would be incurred to degraded and predominantly exotic vegetation. The exotic vegetation has minimal ecological value and provides marginal foraging habitat for native fauna.

4.1.2 Loss of fauna habitat

The proposal will likely remove a small amount of potential foraging and roosting habitat. Approximately 0.03 ha of Southern Highlands Shale Woodland in 'SPT' condition will be removed. This impact is considered relatively minor given threatened fauna in the locality are generally highly mobile (e.g. microbats) and that the remaining vegetation in the locality contains fauna habitat of higher conservation significance. There is one hollow bearing tree within the study area, however this is an exotic species and not considered important as fauna habitat. Some creek banks provide nesting areas for Spotted Pardalote (Error! Reference source not found.) however, there is extremely limited foraging habitat for these birds in the study area. Two small piles of woody debris and fallen timber will likely be removed during the proposed development. These areas are very small in size and provide limited habitat for reptiles, birds and small mammals. Areas of artificial wetlands, which constitute 2% of the study area are extremely degraded. Some wetlands were dry during field assessment and most have no associated aquatic vegetation. All wetland areas have been heavily trampled by cattle and offer very limited habitat for fauna.

The remaining majority (~98%) of the study area consists of exotic pasture, plantings and weeds and exotics and is considered to provide minimal foraging habitat for fauna.

4.2 Indirect impacts

It is difficult to quantify indirect impacts of the proposed development, but these may include impacts such as erosion and water quality impacts that may be associated with the construction phase of the project. These impacts will be managed through the development of a Construction Environmental Management Plan (CEMP). Given the disturbed nature of the study area, and the implementation of appropriate controls, indirect impacts from the proposal are likely to be relatively minor.

4.3 Avoidance and mitigation

4.3.1 Vegetation clearing

The proposal will remove a small amount of native vegetation (~0.03 ha of Southern Highlands Shale Woodland) in a 'SPT' condition which constitutes 0.02% of the study area. These areas are along the boundary of the study area and clearing may be avoided altogether depending on the final development footprint. The recommended implementation of a VMP (see below) will potentially mitigate this loss of native vegetation.

4.3.2 Vegetation Management Plan (VMP)

Approximately 1.7 ha of riparian land (**Figure 3.2**) is potentially impacted by this proposal and may be restored through the implementation of a VMP.

4.3.3 Loss of fauna habitat

The entire development is to occur on extremely degraded land, which provides minimal foraging habitat for fauna. Some creek banks provide nesting areas for Spotted Pardalote and these features may be retained through the implementation of a VMP. It is recommended that the only two native trees (*E. radiata*) identified within the study area be retained as a source of foraging and roosting habitat.

4.3.4 Construction Environmental Management Plan

To avoid potential indirect offsite impacts during construction, an appropriate erosion and sedimentation control plan should be in place following best practice protocols such as that detailed in Landcom (2004). It is recommended that this and the pre-clearance two-staged clearing protocol is included in a site-specific CEMP, prior to any construction works taking place.

4.4 Legislative context

4.4.1 Commonwealth considerations

Environment Protection and Biodiversity Conservation Act 1999

No Matters of National Environmental Significance (MNES) will be impacted by the proposal.

4.4.2 State considerations

Biodiversity Conservation Act 2016

Approximately 0.03 ha of Southern Highlands Shale Woodland EEC will be impacted by this proposal. An impact assessment in accordance with Section 7.3 of the BC Act (i.e.: Test of Significance) and associated guidelines (OEH 2018) has been undertaken. This assessment found that subject to the avoidance and mitigation measures outlined in **Section 4.3**, there will be no significant impacts to the EEC.

Biodiversity Conservation Regulation 2017

Approximately 0.03 ha of native vegetation will be impacted by this proposal. This area is less than the area threshold established under the BC Reg. Additionally, the study area does not include land mapped on the Biodiversity Values Map. Consequently, the thresholds for entry into the Biodiversity Offsets Scheme have not been exceeded and a Biodiversity Development Assessment Report is not required for the proposed development.

Water Management Act 2000

The proposal includes development within 40 metres from the top of bank of a watercourse, consequently impacting upon waterfront land under the *Water Management Act 2000* (WM Act). Therefore, controlled activity approval will be necessary in accordance with this Act.

4.4.3 Local considerations

Wingecarribee Local Environmental Plan 2010

A small portion of the subject site (~1.7 ha) is mapped in WLEP's 'Natural Resource Sensitivity-water' map (WLEP 2010) and as such the consent authority must consider the following matters under Clause 7.5.

Clause 7.5(4)

Development consent must not be granted to development on land to which this clause applies unless the consent authority is satisfied that:

(a) the development is designed, sited and managed to avoid any potential adverse environmental impact, or
(b) if that impact cannot be avoided — the development is designed, sited and will be managed to minimise that impact, or
(c) if that impact cannot be minimised — the development will be managed to mitigate that impact.

The proposal will likely impact upon riparian land, and in respect of clause 7.5 of the WLEP, mitigation of this impact can be achieved through the preparation and implementation of a Vegetation Management Plan which should aim to restore aquatic and riparian vegetation within these areas.

5 Conclusion and recommendations

The proposal will directly impact on ~122 ha of vegetated land, of which ~0.03 ha consists of native vegetation (Southern Highlands Shale Woodlands) and the remaining majority consists of 'Exotic pasture', 'Plantings' and 'Weeds and exotics'.

The study area includes two native trees (*Eucalyptus* radiata) which represent Southern Highlands Shale Woodlands in the condition class 'scattered paddock trees'. This vegetation has no midstorey and a mixed groundlayer of native grasses and forbs, exotic grasses and herbaceous weeds. Southern Highlands Shale Woodlands is listed as an EEC under the BC Act and is encompassed by Southern Highlands Shale Forest and Woodland of the Sydney Basin Bioregion which is a CEEC under the EPBC Act. Consideration of the condition thresholds in the Conservation Advice (TSSC 2015) resulted in the conclusion that the Southern Highlands Shale Forest and Woodland is not a MNES and thus it was not assessed in accordance with the Significant Impact Criteria (DoE 2013). Assessment in accordance with Section 7.3 of the BC Act determined that the proposed development is not likely to have a significant effect on Southern Highlands Shale Woodlands.

No threatened flora species listed under the EPBC Act or BC Act were identified in the study area during field assessment and all species were identified as either having a 'low' or 'not present' likelihood of occurrence. Whilst several threatened microbat species have the potential to utilise the site for foraging and roosting habitat, the current proposal requires the removal of a small area of native vegetation (~0.03 ha of Southern Highlands Shale Woodland in 'scattered paddock trees' condition). It is recommended that these trees be retained if possible however their removal is not likely to significantly affect the ecology of local fauna.

The proposal includes development that will impact upon waterfront land under the NSW *Water Management Act 2000* (WM Act) and riparian land under the Wingecarribee LEP (2010). Therefore, controlled activity approval will be necessary in accordance with the WM Act. In regard to clause 7.5 of the WLEP, it is recommended that restoration of aquatic and riparian vegetation and habitat be achieved through the preparation and implementation of a Vegetation Management Plan.

References

ABRS (2009). *Australian Faunal Directory.* Australian Biological Resources Study, Canberra. Accessed at: http://www.environment.gov.au/biodiversity/abrs/online-resources/fauna/afd/home

Christidis, L. and Boles, W. (2008). Systematics and taxonomy of Australian birds, CSIRO Publishing, Collingwood, Victoria.

Cogger, H. G. (2014). Reptiles and Amphibians of Australia. CSIRO Publishing, Collingwood, Victoria.

Commonwealth Department of the Environment (DoE) (2018a). Protected Matters Search Tool. Accessed at: http://www.environment.gov.au/epbc/protected-matters-search-tool

Commonwealth Department of the Environment (DoE) (2018b). Southern Highlands Shale Forest and Woodland in the Sydney Basin Bioregion in Community and Species Profile and Threats Database, Department of the Environment, Canberra. Accessed at: http://www.environment.gov.au/sprat.

Commonwealth Department of the Environment (DoE) (2013). Matters of National Environmental Significance: Significant impact guidelines 1.1 Environmental Protection and Biodiversity Conservation Act 1999. Canberra.

Harden G J (1990 – 2002). Flora of New South Wales. NSW University Press, Kensington, NSW.

Landcom (2004). Managing Urban Stormwater: Soils and Construction. NSW Government

NSW Dept. of Planning and Environment (DPE) (2018). NSW Planning Viewer Beta. NSW Government. Accessed at: https://maps.planningportal.nsw.gov.au/Terms

NSW Land and Property Information (LPI) (2018). SIX Maps. Accessed at: https://maps.six.nsw.gov.au/

NSW Office of Environment and Heritage (OEH) (2018). Threatened Species Test of Significance Guidelines. Accessed at: https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Threatened-species/threatened-species-test-significance-guidelines-170634.pdf

NSW Office of Environment and Heritage (OEH) (2018). BioNet Atlas of NSW Wildlife. Accessed at: http://www.environment.nsw.gov.au/atlaspublicapp/UI_Modules/ATLAS_/AtlasSearch.aspx

PlantNET (RBGDT, 2017). NSW Flora Online. Accessed at: http://plantnet.rbgsyd.nsw.gov.au/

Tozer, M.G., Turner, K., Simpson, C., Keith, D.A., Beukers, P., MacKenzie, B., Tindall, D. & Pennay, C. (2010). Native vegetation of southeast NSW: a revised classification and map for the coast and eastern tablelands. NSW Department of Environment and Conservation & NSW Department of Natural Resources.

Threatened Species Scientific Committee (TSSC) (2015). Approved conservation advice (incorporating listing advice) for Southern Highlands Shale Forest and Woodland of the Sydney Basin Bioregion (EC62).

Van Dyck, S. and Strahan, R. (2008) The mammals of Australia, 3rd ed, New Holland Publishers, Sydney.

Wingecarribee Local Environmental Plan (WLEP) (2010). Natural Resources Sensitivity Map – Sheet NRS_007. Accessed at: https://legislation.nsw.gov.au/maps/ef08025a-1c0e-cf7d-8bd5-bdccf7bd4b17/8350_COM_NRS_007_080_20120123.pdf

Appendix A: Species likelihood of occurrence

The potential for each threatened species, population and/or migratory species to occur was considered and the necessity for targeted field surveys was determined. Following field surveys and review of available habitat within the subject site, the potential for species to use the site and be affected directly or indirectly by the proposed action were considered as either:

- "Recent record" = species has been recorded in the study area within the past 5 years
- "High" = species has previously been recorded in the study area (<5 years ago) or in proximity to (for mobile species), and/or habitat is present that is likely to be used by a local population
- "Moderate" = suitable habitat for a species is present onsite but no evidence of a species detected and relatively high number of recent records (5-20 years) in the locality or species is highly mobile
- "Low" = suitable habitat for a species is present onsite but limited or highly degraded, no evidence of a species detected and relatively low number of recent records in the locality
- "Not present" = suitable habitat for the species is not present onsite or adequate survey has determined species does not occur in the study area

Scientific Name Common Name	Legal status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
KINGDOM: Animalia; CLASS: Aves						
Artamus cyanopterus Dusky Woodswallow	BC Act: V	2	4.4km (19/01/2017)	19/01/2017 (4.4km)	Low	Low
Botaurus poiciloptilus Australasian Bittern	BC Act: E1 EPBC Act: E	2	3.2km (4/08/2000)	4/08/2000 (3.2km)	Low	Low
Callocephalon fimbriatum Gang-gang Cockatoo	BC Act: V	7	0.4km (30/09/2010)	22/12/2016 (3.0km)	Moderate	Low
Gallinago hardwickii Latham's Snipe	EPBC Act: C, J, K	3	2.1km (28/01/2004)	20/01/2017 (2.4km)	Not present	Not present
Haliaeetus leucogaster White-bellied Sea-Eagle	BC Act: V EPBC Act: C	1	4.7km (23/03/2017)	23/03/2017 (4.7km)	Low	Low
Hieraaetus morphnoides Little Eagle	BC Act: V	1	3.1km (15/07/2015)	15/07/2015 (3.1km)	Low	Low
Oxyura australis Blue-billed Duck	BC Act: V	2	4.0km (18/09/2017)	18/09/2017 (4.0km)	Low	Low
Plegadis falcinellus Glossy Ibis	EPBC Act: C	1	3.1km (11/12/2000)	11/12/2000 (3.1km)	Not present	Not present
Rostratula australis Australian Painted Snipe	BC Act: E1 EPBC Act: E	1	4.0km (30/11/2012)	30/11/2012 (4.0km)	Low	Low
Stictonetta naevosa Freckled Duck	BC Act: V	2	4.0km (30/11/2012)	30/11/2012 (4.0km)	Low	Low
KINGDOM: Animalia; CLASS: Mammalia						
Miniopterus schreibersii oceanensis Eastern Bentwing-bat	BC Act: V	2	2.1km (14/02/2012)	14/02/2012 (2.1km)	Low	Low

Scientific Name Common Name	Legal status	Number of records	Closest record and date	Most recent and proximity	Likelihood of occurrence	
					Prior to field assessment	Post field assessment
Myotis macropus Southern Myotis	BC Act: V	1	2.4km (9/02/2012)	9/02/2012 (2.4km)	Low	Low
Phascolarctos cinereus Koala	BC Act: V EPBC Act: V	4	0.9km (30/06/2006)	1/05/2014 (3.1km)	Low	Not present
Pteropus poliocephalus Grey-headed Flying-fox	BC Act: V EPBC Act: V	1	1.2km (23/01/2017)	23/01/2017 (1.2km)	Low	Low
KINGDOM: Plantae						
Eucalyptus macarthurii Paddys River Box, Camden Woollybutt	BC Act: E1 EPBC Act: E	208	0.4km (29/07/2016)	21/02/2017 (4.6km)	Low	Not present

Unless other stated, text is taken from the OEH Threatened Species (http://www.environment.nsw.gov.au/threatenedspecies/); Legal Status codes from the Atlas of NSW Wildlife: V = Vulnerable, E = Endangered, E2 = Endangered Population, C = China and Australia Migratory Bird Agreement (CAMBA), J = Japan and Australia Migratory Bird Agreement (JAMBA); K = Republic of Korea Migratory Bird Agreement (ROKAMBA), BC Act = *Biodiversity Conservation Act 2016,* EPBC Act = Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This list does not include marine species as suitable habitat is not present on site.

Appendix B: Flora and fauna species inventory

Flora

Family	Species	Common name	"Chelsea Gardens" (Lot 12 // DP 866036)	"Coomungie" (Lot 3 // DP 706194)
Asteraceae	*Arctotheca calendula**	Capeweed	X	
Asteraceae	*Cirsium vulgare**	Spear Thistle	X	X
Asteraceae	*Gamochaeta* sp.*	Cudweed	X	
Asteraceae	*Hypochaeris radicata**	Catsear		X
Asteraceae	*Senecio madagascariensis**	Fireweed	X	
Asteraceae	*Silybum marianum**	Variegated Thistle	X	X
Asteraceae	*Solenogyne bellioides*		X	
Asteraceae	*Sonchus oleraceus**	Common Sowthistle	X	
Asteraceae	*Taraxacum officinale**	Dandelion	X	X
Callitrichaceae	*Callitriche muelleri*		X	
Caryophyllaceae	*Cerastium glomeratum**	Mouse-ear Chickweed	X	
Cupressaceae	*Cupressus macrocarpa**	Monterey Cypress		X
Cupressaceae	*Cupressus* sp.			X
Cyperaceae	*Carex longebrachiata*		X	
Cyperaceae	*Eleocharis sphacelata*		X	
Fabaceae - Faboideae	*Trifolium repens**	White Clover	X	
Fabaceae - Faboideae	*Ulex europaeus**	Furze		X
Fabaceae - Mimosoideae	*Acacia parramattensis*	Parramatta Wattle	X	
Haloragaceae	*Gonocarpus tetragynus*		X	
Juncaeae	*Juncus continuus*			X
Juncaeae	*Juncus usitatus*		X	
Lythraceae	*Lythrum hyssopifolia**	Hyssop Loosestrife		X
Malvaceae	*Malva parviflora**	Small-flowered Mallow	X	

Family	Species	Common name	"Chelsea Gardens" (Lot 12 // DP 866036)	"Coomungie" (Lot 3 // DP 706194)
Malvaceae	*Modiola caroliniana**	Red-flowered Mallow	X	
Myrtaceae	*Eucalyptus radiata*	Narrow-leaved Peppermint	X	
Pinaceae	*Pinus pinaster**	Cluster Pine	X	X
Pinaceae	*Pinus radiata**	Radiata Pine	X	X
Plantaginaceae	*Plantago lanceolata**	Lamb's Tongues	X	X
Poaceae	*Axonopus fissifolius**	Narrow-leaved Carpet Grass	X	
Poaceae	*Bromus catharticus**	Prairie Grass		X
Poaceae	*Cenchrus clandestinus**	Kikuyu	X	X
Poaceae	*Cynodon dactylon*	Couch	X	X
Poaceae	*Dactylis glomerata**	Cocksfoot		X
Poaceae	*Lolium* sp.*	Rye grass	X	X
Poaceae	*Nassella trichotoma**	Serrated Tussock	X	
Poaceae	*Poa annua**	Winter Grass		X
Poaceae	*Rytidosperma* sp.	Wallaby Grass	X	
Polygonaceae	*Rumex crispus**	Curled Dock	X	
Primulaceae	*Lysimachia arvensis**	Scarlet Pimpernel	X	
Ranunculaceae	*Ranunculus repens**	Creeping Buttercup	X	
Rosaceae	*Acaena novae-zelandiae*		X	
Rosaceae	*Malus* sp.*	Apple	X	
Rosaceae	*Pyracantha* sp.*	Firethorn	X	
Rosaceae	*Rosa rubiginosa**	Sweet Briar	X	
Rosaceae	*Rubus fruticosus**	Blackberry	X	
Rubiaceae	*Asperula conferta*	Common Woodruff	X	
Saliacaceae	*Salix* sp.*	Willow	X	
Solanaceae	*Datura* sp.*	Thornapple	X	X

* = exotic

Fauna

Family	Common Name	Scientific name	Sighting Notes
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	OW
Alcedinidae	*Dacelo novaeguineae*	Kookaburra	O
Anatidae	*Chenonetta jubata*	Australian Wood Duck	O
	Malacorhynchus membranaceus	Pink-eared Duck	O
	Aythya australis	Hardhead Duck	O
Artamidae	*Strepera graculina*	Pied Currawong	W
	Gymnorhina tibicen	Australian Magpie	OW
Cacatuidae	*Cacatua galerita*	Sulfur-Crested Cockatoo	OW
	Eolophus roseicapillus	Galah	W
Charadriidae	*Vanellus miles*	Masked Lapwing	O
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	O
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	O
Maluridae	*Malurus cyanea*	Superb Fairy Wren	OW
Meliphagidae	*Manorina melanocephala*	Noisy Miner	W
Monarchidae	*Grallina cyanoleuca*	Magpie-lark	OW
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush	O
Psittaculidae	*Platycerus elegans*	Crimson Rosella	W
	Platycerus eximis	Eastern Rosella	*O*
	Alisterus scapularis	Australian King Parrot	W
Sturnidae	*Sturnus vulgaris*	*Common Starling	O
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	O
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis	O
Macropodidae	*Macropus giganteus*	Eastern Grey Kangaroo	O
Myobatrachidae	*Crinia signifera*	Common Eastern Froglet	W

O = observed; W = Heard

Appendix C: Assessments of Significance

State listings under the BC Act

Southern Highlands Shale Woodlands in the Sydney Basin Bioregion - endangered ecological community

a. *in the case of a threatened species, whether the proposed development or activity 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.*

Not applicable.

b. *in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:*

   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.*

The ***local occurrence*** of an ecological community is defined by OEH (2018) as that which: *occurs within the study area… including adjacent areas if the ecological community on the study area forms part of a larger contiguous area of that ecological community and the movement of individuals and exchange of genetic material across the boundary of the study area can be clearly demonstrated.*

The proposed development will result in the removal of two *Eucalyptus radiata* (Narrow-leaved Peppermint) which represents 0.03 ha of Southern Highlands Shale Woodlands (SHSW) in a 'scattered paddock tree' condition. These trees were not mapped within the current known extent of SHSW (Tozer et al. 2010) and therefore, the proposed development is unlikely to adversely impact on the extent of the ecological community or adversely modify the composition of the ecological community, such that its local occurrence is likely to be placed at risk of extinction.

c. *in relation to the habitat of a threatened species or ecological community:*

   i. *the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and*

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

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

The proposed development will result in the removal of 0.03 ha of SHSW in a 'scattered paddock tree' condition. The proposed development will not result in the fragmentation or isolation of other areas of habitat as the vegetation in the study area already exists in small patches. The importance of the vegetation proposed for removal to the long-term survival of SHSW is low, given that it is an extremely small amount and in a degraded condition.

d. whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

No area of outstanding biodiversity value has been declared within the study area.

e. whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

There is one key threatening processes of relevance to this proposal:

- Clearing of native vegetation

The proposed action will result in the removal of 0.03 ha of SHSW in a 'scattered paddock tree' condition class.

Conclusion of Section 7.3 test of significance for Southern Highlands Shale Woodland

The proposed development is not likely to have a significant effect upon SOFF because:

- a small amount which is not identified as part of the local occurrence is proposed for removal
- the removal of the 0.03 ha of SHSW in a degraded condition is not important for the long-term survival of the local occurrence of SHSW